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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Indexes for the previous 6 months will be found in the First number of July and the First number of January.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, American Gas Institute.

To the Members of the American Gas Institute: All members of the Institute are earnestly requested to send in as soon as possible contributions for this year's Wrinkle Department report. The success of the Department depends entirely on the co-operation and assistance of the members.

Mail all contributions to Milan R. Bump, Editor, No. 40 Wall street, New York city.

[NOTICE.]

Third Annual Meeting, Natural Gas Association of America.

OFFICE OF THE SECRETARY,
KANSAS CITY, MO., April 6, 1908.

To the Members, Natural Gas Association of America: Gentlemen—The third annual meeting of the Natural Gas Association of America will be held in Kansas City, Tuesday, Wednesday and Thursday, May 19th, 20th and 21st. The following papers will be read:

"Geology Relative to Natural Gas," by Mr. F. H. Oliphant.

"Transportation of Natural Gas," by Mr. Wm. M. Welsh, Chief Engineer Kansas Natural Gas Company, Independence, Kas.

"Method of Distribution Management," by Mr. James Strickler, City Superintendent, Columbus, O.

"Field Operation," by Mr. Walter McClay, General Superintendent, Philadelphia Company, Pittsburgh, Pa.

"Methods of Accounting," by Mr. W. R. Hadley, Pittsburgh, Pa.

"Installation of Distribution Systems," by Mr. John B. Klumpp, U. G. I. Company, Philadelphia, Pa.

Other papers, the Question Box and Wrinkles, are in the course of preparation, and announcement of the titles of the papers will be made later.

For the entertainment of the delegates outside of the business meetings, arrangements are in the hands of an Entertainment Committee for visits to various parts of this very interesting city, and for a banquet on Thursday night. There will also be trips of interest; and a theater party for the ladies. The business meetings and the banquet will be held on the roof garden of this hotel. It is suggested that reservations for rooms be made at as early a date as possible.

It has also been determined to take the entire ground floor of a building immediately south of the Savoy Hotel, which will be the headquarters of the Association for the purpose of demonstrating various appliances for using natural gas.

This room is large, well lighted, well ventilated and readily accessible, not only to the members of the Association, but also to the public. As the building is piped the various appliances exhibited can be shown in actual operation. Manufacturers of appliances wishing to make a demonstration thereof may obtain any necessary or desired information concerning this display by applying to Mr. R. O. Fritz, 2012 Baltimore avenue, Kansas City, Mo. Yours very truly,

GEORGE S. BARROWS, Sec'y.

LIBRARY OF CONGRESS
APR 13 1908
SMITHSONIAN DEPOSIT.

BRIEFLY TOLD.

THE EMERGENCY CORPS OF THE CONSOLIDATED GAS COMPANY.—Those who are served by a great corporation, more especially if the bulk or all of that corporation's trading is confined to a great and populous center, know little and seemingly care less of the methods which enter into such trading. And it is more than regrettable that such is the case. In this particular instance, how many of the customers of the Consolidated Gas Company, of Manhattan Borough, know that it maintains a system for their protection that enlists the services of many men, a number of horses and wagons, with the rental costs involved in their housing, and an extensive and complete equipment in minor details. Further, the cost of all this goes annually into tens of thousands of dollars. Such, however, is the fact; and that fact it is can be easily determined by reading the complete description of the emergency corps and its working that appears in this number of the JOURNAL. The story was prepared for us especially in order to show to what careful lengths even a corporation that deals right with the home life of its customers can go. The author tells the story so plainly that we could add nothing by way of description which would bring out the cause for or the effect and value of the corps and its work that would make it all any plainer. We would, however, like to call the attention of the government of the State and of the city to a lesson which this work on the part of the Company surely teaches. This great corporation, harassed as it has been by the legislators of both State and municipal sorts, and confronted by the prejudice and ill-will of thousands whom it actually serves, voluntarily assumes a work that it is in no sense bound by its charters or franchises to carry on, the beneficence of which can hardly be estimated. The service rendered appeals at once to the humanitarian and utilitarian points of view equally as does the working of the insurance patrol, but with this difference that the entire burden of the expense of the system is borne by the Company. It is true it may be said, with some show of good reason, that the expenditure is recouped in many ways to the Company; but it is also true that for every benefit the Company secures by and through the maintenance of an emergency staff, the general community is benefited in far greater proportion.

THE INFORMATION BUREAU OF THE AMERICAN GAS INSTITUTE.—It certainly looks that one of the features of the Bureau of Information, which was deservedly very prominent, and which it was confidently thought, by all interested in its development, would be fully taken advantage of by the fraternity at large, is, to say the least, being quite neglected by them. This feature is comprised under the heading of "Answers-at-Large" from anyone of the gas fraternity to any of the questions submitted. It is one of the main directions of the Bureau of Information that these questions be published in the GAS JOURNALS as they are submitted, for in that way the fraternity at large will have the questions directly before them. The Bureau, through its Editor, Mr. W. A. Baehr, St. Louis, Mo., wishes us to say that the Bureau earnestly solicits answers to those questions, from or by anyone interested, and the answerer need not be a member of the Institute. We certainly are firm in the belief that the answers-at-large would constitute a highly valuable portion of the work of the Bureau, and this mention is made to make the matter plain to all, and to urge those who desire to help the work along to send in one or more replies. Editor Baehr has devoted much time to this work—not that he is in any sense anxious to call attention thereto, or to abate it in continuance—but he does wish and desire that a goodly recompense to him for it will be a number of answers from many men. The greater the better.

AND HERE ARE THE NEXT QUERIES.—We are in receipt from Editor Baehr, under date of the 7th inst., of two additional questions, in sequence to those heretofore published. Now see to it that the answers will come along with speed and goodly number. The questions are:

Question No. 17. "What is the plan of piping to use, to keep the water in tank and cup of 400,000 cubic foot holder from freezing, in locality where mercury drops to 30° below zero?"

Question No. 18. "Is the flame temperature of a Bunsen flame greater than that of a luminous flame, provided the consumption and pressure are the same, and gas is burned under ordinary atmospheric conditions? Is a gas radiator equipped with a Bunsen burner more efficient than one equipped with a luminous burner?"

CURRENT COMMENT.—

LAST week marked the 30th year of Colonel Frank S. Richardson's active connection with the North Adams (Mass.) Gas Company. To look at him (carefully, too, mind you) he seems good for 30 more years.

MR. C. H. WILLIAMS has resigned the position of Manager of the La Crosse (Wis.) Gas and Electric Company.

AT a special meeting of the Board of Directors of the Louisville (Ky.) Gas Company, held in the offices of the Fidelity Trust Company, the 30th ult., a very beautiful series of minutes to the memory of Mr. George Gaulbert, who was serving on the Board as a representative of the city's interest in the Company, were adopted and ordered spread on the books of the Company. Mr. F. M. Sackett, President of the Company, directed the proceedings.

CAPT. MCGREGOR declares that the Pawtucket (R. I.) Company will have turned gas on to the outlying settlement of Cumberland Hill long before July 4th.

THE American Socieiy of Mechanical Engineers will hold a special meeting, in its headquarters, the United Engineering Societies' Building, No. 29 West 39th street, the evening of Tuesday next. The subject to be considered is that of "The Conservation of Our Natural Resources," a subject the prominence of which becomes more pronounced every day. The meeting will be addressed by speakers well up in the matter in hand, and we are authorized, through the courtesy of Mr. Lester G. French, to extend an invitation to the gas fraternity to participate in the meeting. Those proposing to be present can obtain programmes from Mr. French.

THE Columbia Trust Company on last Saturday removed its offices from 26 Nassau street to 135 Broadway, corner of Cedar, just a block to the westward of their old location. The clever trust officer of the Company (Mr. David S. Mills) invites gas men generally to look him over in the new establishment.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Ramsdell Supplies an Omission.

RAMSDELL INVERTED LAMP CO.,
NEW YORK, April 8, 1908.

To the Editors AMERICAN GAS LIGHT JOURNAL: Gentlemen—I notice in your issue of April 6th, page 578, in Mr. Eustace's very interesting Presidential address before the Illinois Gas Association at its meeting in Chicago, March 25th, the following:

"There are some things which have not yet been developed by invention which we need. In the three great branches of our industry—light, heat and power—we are equipped with different degrees of completeness. For heat, the stove and burner men have arrived at a very satisfactory stage of development; but it is not so entirely true of the other branches.

"For instance, we need a low candle power, high efficiency, incandescent burner. At the present time there are a large number of different styles of incandescent burners which will give reasonably high efficiency for the gas consumed, provided a fairly large amount of gas is burned giving a large 'observed candle power.'

"Any good mantle burner will give 60 candles for 3 feet, or an efficiency of 20 candles to the cubic foot; but it is necessary to have 3 feet and get 60-candle power to obtain the 20-candle power per foot efficiency. It is not possible for us to supply the trade with a burner consuming 1 cubic foot and giving 20 candles. If a man wants only a 20-candle power light, and is satisfied with that, he must burn his gas in an open flame with an efficiency of 4 candles, instead of 20, to the foot.

"We can tell him to substitute an incandescent burner for his open flame and he will get 20 candles to the foot instead of 4, but he must burn 3 feet and have 60-candle power to effect this economy. If his reply is that a 20-candle power light is ample and all that he wants, we have nothing to offer him except the low efficiency, open flame.'

Evidently Mr. Eustace is not familiar with the Bijou Inverted Gas Lamp, which exactly fills the requirements he mentions, as it consumes 1 cubic foot of gas per hour and gives fully 20 candles of light.

As these very efficient little burners have been on the market several years, and as there are many thousands of them in use in this country, we are somewhat surprised that they have not come to his notice.

Yours very truly, GEO. G. RAMSDELL.

The Emergency Department Maintained by the Consolidated Gas Company, of New York City.

[Prepared for the JOURNAL, by MR. OSCAR H. FOGG.]

The distribution system supplying gas to consumers on Manhattan Island comprises, approximately, 1,425 miles of mains, 150,000 house services and over 600,000 meters, within an area of 22 square miles. The protection of this system, as well as the necessity of providing the most satisfactory method for giving prompt and efficient attention in cases of accident, fire or complaint of leaks, led Mr. C. C. Simpson, General Superintendent of Distribution, to establish a Night Emergency Force, in 1900, to take charge of this branch of the Company's service throughout the night, and on Sundays and holidays, when the routine work of the distribution department was suspended. The emergency department has conclusively demonstrated its value by the work accomplished during its 8 years of operation. Not only have the interests of the Company been safeguarded, but the protection which this system affords to the public is of inestimable value, providing, as it does, a means of promptly rectifying, at any hour, defects in or disarrangement of the consumers' house piping, fixtures or appliances, over which the Company does not ordinarily exercise control.

The area supplied is divided into three districts: One, from the Battery, north to Twenty-third street; one from Twenty-third street, north to Seventy-ninth street, and the third from Seventy-ninth street to Kingsbridge, the northerly extremity of Manhattan Island. At a convenient point in each of these districts is located the station of the emergency department, where, at all hours of the day and night, a crew of experienced men is on duty, with a specially constructed wagon, fully equipped with the necessary tools and implements, and with horse always in harness ready to respond at once to any call that may summon them to a point within their district.

The wagons used are built with rear steps, long side boxes and railings; the side boxes, used as seats for the crew, have hinged covers and contain the tools forming a part of the wagon's equipment. This equipment is a complete one, as shown by the following list:

Emergency Equipment.

Round shovels	4	Key for drip plugs	1
Chisel bars	2	Sounding rod	1
Crowbars	2	Manhole cover hooks	2
Picks and handles	3	Perforated cover for coal chute	1
Striking hammers	1	Rubber gloves, pairs	2
Caulking hammer	1	Electric hand lamps	2
Sledge hammer	1	Extension cable lamps	2
Stopcock keys	2	Battery for same	1
Valve keys	2	Stoppers, 4″ to 8″ inc., each	3
Monkey wrench 10″ and 18″	2	Stoppers, 10″ to 20″ inc., each	2
Stillson wrenchs	3	Bags, 3″ to 8″ inc	2
Cold chisels	2	Bags, 10″ to 12″ inc	2
Breaking chisels	4	Screw plugs, ⅜″ to 2″ inc	6
Diamond point chisels	4	Screw caps, ⅜″ to 2″ inc	6
Half-round chisels	4	Wood plugs, ⅝″ to 8″ inc	2
Bull point chisels	1	Rubber plugs, ¼″ to 2″ inc	2
Dog chisels	2	Soap, fireclay, yarn	..
Yarning irons	2	Rope, 1½″, 15 feet	..
Caulking tools	5	First aid to injured kit	..
Steel frost wedges	4	Book, location of mains	..
Taps, 1″, 1¼″, 1½″, 2″	1	Book, addresses of workmen	..
Cross cut handsaw	1	Safety helmet	..
Pliers, 10″	1	Search light	..
Screwdriver, 18″	1	Generator and tripod	..
Oil and oil can	1	Boots and oil skin suits	..
Tallowed muslin	..		
Hook for street box covers	1		

Frequent inspection of the wagon and equipment is made so that the helmets, lamps, etc., may be always in a serviceable condition, and to insure of all the required articles being carried.

In Fig. 2 is shown the type of wagon used, and the larger tools and appliances carried by it. During the winter months, when the streets are obstructed by snow, a team is used in place of the single horse.

It is, of course, of the utmost importance that a complant of leaking gas be responded to with the greatest possible speed, for what may at one moment be merely a serious leak and easily remedied, if attended to in time, may become a disastrous explosion within the

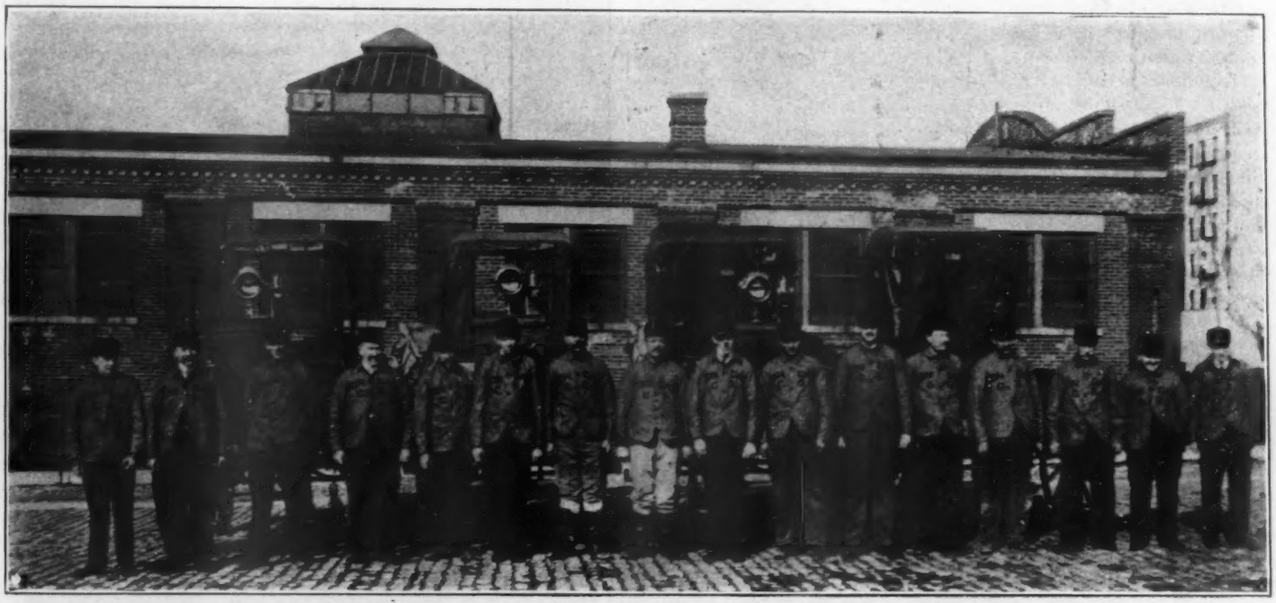

Fig. 1.

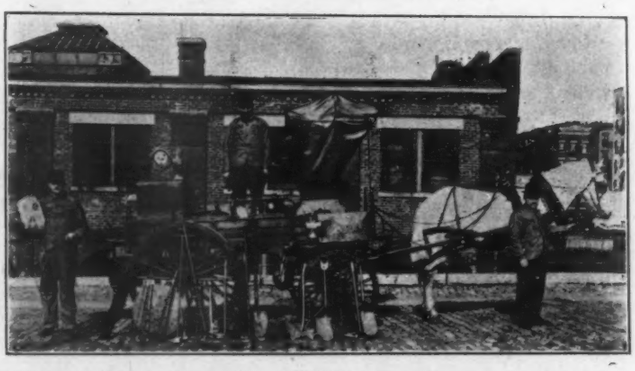

Fig. 2.

instant. On the one hand is a condition which, if promptly rectified, is without serious result, while on the other even a slight delay might result in damage to property or even loss of life, the extent of which may not be estimated.

The practical efficiency of the department is, therefore, largely dependent upon the promptness with which they may respond to the call. The majority of complaints of leaking gas, accident, etc., are telephoned to the Company's emergency stations by policemen, fire-

men, janitors, tenants, or the Company's patrolmen—the station numbers being listed in the telephone directory under the heading "Night Call in Case of Leak, No. ..... " The man on duty at the telephone, immediately on receipt of a call, and before taking the details of the complaint, sounds an electric alarm, which summons the crew, who at once start from their quarters. In the meantime the telephone man has secured the street address, written it on the ticket, and a messenger hands this ticket to the foreman as the wagon passes out of the yard. This has been accomplished within 18 seconds of the time that telephone communication was established between the station and the person reporting the leak, and at no station does this time exceed 40 seconds in the average practice.

In Fig. 3 a wagon is shown leaving the yard in response to a call.

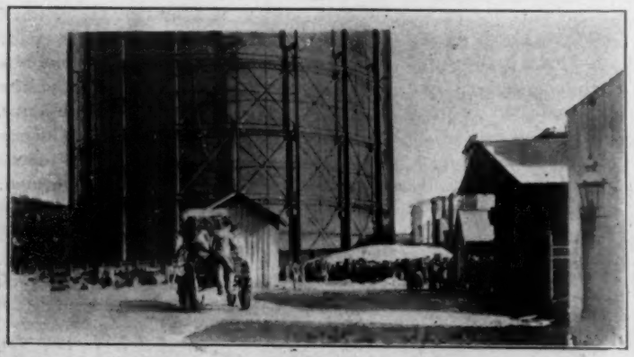

Fig. 3.

The telephone man, after having despatched the wagon, notifies the person reporting the leak that the emergency wagon is on its way, and if the leak is reported as a serious one he cautions them against the use of lights, etc.

The wagon, leaving the yard, proceeds at once to the address given, the alarm gong usually insuring a clear passage. Arriving there, they immediately locate the person making the complaint and then determine the source of the trouble. If it proves to be an inside leak, caused by house piping, fixtures, appliances or meters, it is speedily remedied and the crew returns to its quarters; first, telephoning, however, to learn if any other call has been received since their departure, so that it may be responded to direct, before returning to the station. If, however, the leak is a serious one and coming from the street, the men at once ventilate the premises, set up their searchlight and, securing whatever street tools they may require, they proceed to make an opening. While the crew is thus engaged, their wagon, the driver of which has a list of the Company's regular workmen living in the district, collects a force of these men and brings them to the scene. They then take up the work of locating and repairing the leak, the emergency wagon returning to the station to be in readiness for any other calls that may come in.

The men composing these emergency crews are skilled mechanics. The first, and most important rule impressed upon them, is to "get there quickly," and the efficiency of the department in this respect has been well maintained.

A series of competitive tests are made from time to time, based upon the result of which cash prizes are awarded the members of that crew having the highest speed average for the given period.

These tests consist of trial calls, where, unknown to the men, a report of a serious leak is telephoned to one of the stations. At the instant telephone communication is had with the station, the stop watch is snapped and the time required for the crew to reach the address given is recorded. The distance covered is reduced to an average number of feet travelled per minute, and it is upon this basis that the award is made. The men take great interest in the efficiency of their respective crews, and there is keen rivalry in their effort to make the best record. An emergency crew has reached the scene of a supposed accident, nearly 1 mile distant from its station, tools in hand and ready to work, within 3 minutes and 49 seconds of the time the telephone bell rang, travelling the distance at an average rate of 1,318 feet per minute. This is not an exceptional performance, but is indicative of the general standard maintained throughout the department, not only in these special or test calls, but in the line of the actual emergency work. One case which illustrates this latter point may be cited—it is typical of many.

From a large apartment house, in a residential section of the city, a report of a serious leak was telephoned to one of the emergency stations, in the morning hours (2:40 A.M.). This point was at a distance of 1.23 miles from the station, and when the crew arrived upon the ground they found the house full of gas and the occupants in a state of panic. In 10 minutes from the time this call had been received at the station, the service valve was closed, the building ventilated, and the possibility of an explosion averted. Subsequent investigation proved the leak to have been due to the fusing of the service pipe by grounded current; the defective insulation of an outside wire resulting in contact of the conductor and a metal awning post, close to the base of which lay the service pipe. The escaping gas followed the service into the basement and thence throughout the building.

By far the greater number of calls to which the emergency department responds are those caused by accident to or disarrangement of the consumers' house piping, fixtures or appliances. Falling chandeliers, broken brackets and leaking house pipes form the majority of this class of complaint. As has been stated, the Company does not ordinarily exercise control over this private property, but such calls are always immediately responded to and the leak secured. The consumer is thus afforded prompt relief from a condition, which, if allowed to go without attention until morning, would cause considerable inconvenience, if no more serious result.

Frequently the crews are summoned on fire calls by the Fire Department, their duty in such cases usually being to shut off the gas supply to burning buildings.

That the firemen and policemen may readily call out the crews in any emergency, small gummed labels are supplied them to be pasted in the helmet or cap, which give the several emergency districts with the station locations and telephone numbers. An outline map of the city giving this information, and of which Fig. 4, is a copy, is also supplied to the police and fire stations.

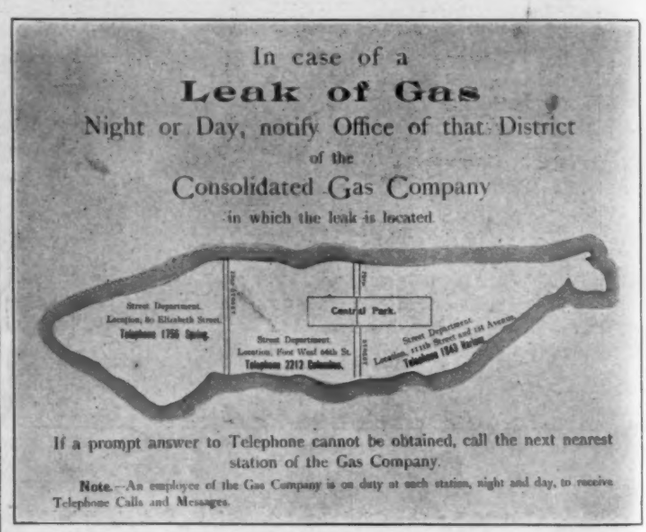
In case of a
Leak of Gas
Night or Day, notify Office of that District
of the
Consolidated Gas Company
in which the leak is located
Central Park.
Street Department.
Location, 80 Elizabeth Street.
Telephone 1756 Spring.
Street Department.
Location, West 63d St.
Telephone 2212 Columbus.
Street Department.
Telephone 1940 Harlem.
If a prompt answer to Telephone cannot be obtained, call the next nearest station of the Gas Company.
Note.—An employee of the Gas Company is on duty at each station, night and day, to receive Telephone Calls and Messages.

Fig. 4.

In addition to the emergency stations shown upon the map, several sub-stations are maintained in the more congested districts. These substation crews, however, do not receive complaints direct, but are despatched by the district office in cases where they may more promptly reach the point than could the station crew. In cases of extreme need, the entire emergency force on duty throughout the city could be quickly assembled at any point, and this force would be constantly added to as the wagons collected the regular workmen and brought them to the scene. Fortunately, such a contingency seldom arises, the work within the several districts usually being so distributed that it may be satisfactorily handled in the routine manner above described.

For work of this nature, much of which must be performed at night, efficient and safe means of illumination must be provided.

The searchlight, elsewhere referred to, consists of an acetylene lamp and generator, with box and tripod, as shown in Fig. 5. The lamp is mounted upon a pivot, so that its light may be thrown upon any desired point. It is used principally in street work and is set up at a safe distance from the leak or opening. For inside work, hand battery electric lamps are used, or the incandescent hand lamps connected to the large battery by extension cords. These are also of value in manhole work, or where, because of lack of space, the hand battery lamp

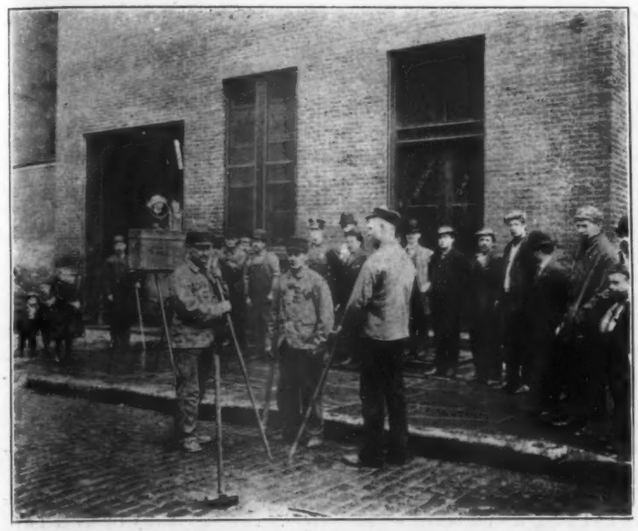

Fig. 5.

may not be so conveniently used. These lamps are shown in Fig. 7.

The safety helmet, shown in Figs. 6 and 7, has proven useful in cases where the men are required to enter vaults or cellars where gas is escaping in large quantities. The helmet consists of a rubber headpiece, compressed air tank, gauge and valves. The headpiece is lined inside with wool pads for the purpose of absorbing the moisture of the wearer's breath. A woollen collar is adjusted to fit the neck of the wearer snugly, and the flow of air from the tank to the headpiece is regulated by a needle valve. So equipped, the workman may remain in a gas filled room for from 30 to 45 minutes without discomfort.

In Fig. 6 is shown a man wearing the helmet and about to enter a cellar, the lifeline which is attached to him being held by the attendant who remains outside. The helmets may also be used to advantage in deep trenches where gas is escaping, under planking, or in similar places where it would be otherwise unsafe to venture.

The public service corporations of to-day, operating under metropolitan conditions, have been generally led to adopt the emergency department as a necessary adjunct to their service. With the street railway operating companies, the corporations distributing electricity, etc., the function of this department usually is to remedy accidents to plant or system that would result in hindrance to traffic or interruption of service. As maintained by the gas company, however, every

Fig. 6.

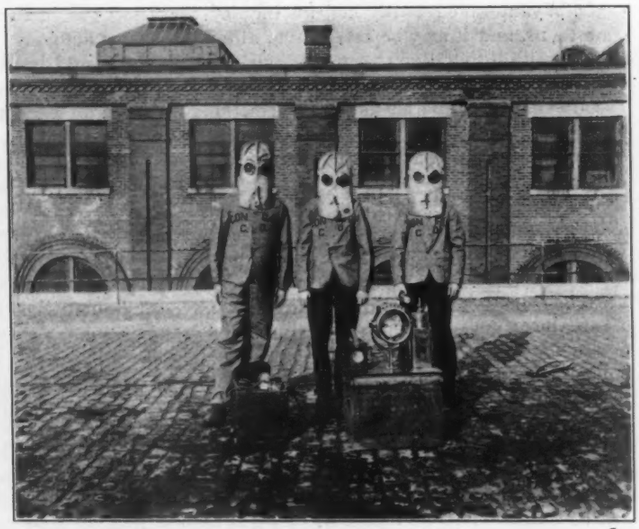

Fig. 7.

Fig. 8.

effort is directed towrad the prevention of the accident, by correcting the conditions before it may occur.

During the past year (1907) the Cons lidated Gas Company's Emergency Department responded to 1,349 night calls. Minor accidents, asphyxiations, etc., may not be wholly eliminated in a system of such magnitude, with more than 600,000 meters in use, each one supplying its own more or less complicated network of house piping; but since this Department was established, in 1900, not one serious explosion due to illuminating gas has occurred within the 22 square miles of congested city area supplied by this Company; nor, in fact, have even minor accidents occurred resulting from escaping gas, save in the few cases where failure to promptly notify the Company made it impossible to apply the customary precautions.

[Official Report.—As Furnished by the Secretary.—Continued from Page 533.]

THIRTY-EIGHTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 19 and 20, 1908.

First Day—Morning Session.

QUESTION BOX.

"What new and successful devices are being used to extend the gas business?"—[*Discussion concluded.*]

Mr. Wyant—We recently had an inquiry for using gas in a way new to us, and it may be interesting, although I have not gone far enough with it to tell you very definitely about it, and would be glad of some information on the subject. We have a consumer who is a gasoline gas user, and his method is something like this: In a generator consisting of a series of trays he places 86° gasoline. He also has an air pressure produced by a fan blower of about 24 inches, which he blows directly into a closed air supply pipe. He also passes this air through the gasoline generator, thus producing the gasoline gas, and admits it under 24 inches pressure to a main distributing pipe, as we would with gas under pressure. Now, what they want to accomplish, aside from the utilization of the heat, is to use a burner with only one hose. In order to accomplish this they now put a small mixing arrangement in direct connection with the high pressure gas pipe on one side and the high pressure air pipe on the other, with a valve to control the supply of each, and carry away from it one piece of rubber tubing or hose, connected to a burner perhaps 50 feet away from this mixing chamber. The hose carries the mixture of gas and air almost in the proportion in which it is burned, the small excess of air required for complete combustion being admitted at the burner itself. It is a fruitful field for experiment on our part, because there is a good gas consumption to be obtained. I am at present making some experiments in the matter, and am attempting to use gas without making any change whatever in their apparatus, simply cutting off the gasoline generator and substituting gas under pressure by a fan exhauster. Just what pressure it is necessary to maintain on the gas pipes I am not certain about, but it does appear that, in order to use the one hose for the mixture, it is necessary to use a higher gas pressure than would normally be carried in the gas main. If anyone has had any experience along these lines in increasing the gas pressure and in using a single hose I should be very glad to hear of it.

Mr. J. J. Humphreys—I think Mr. Wyant will find there is a patented arrangement for mixing air and gas to burn with closed bottom Welsbachs, which was exploited in Canada and possibly in the United States. This would probably accomplish what he is trying to do.

The President—That explanation, Mr. Wyant, possibly will help you some.

Mr. Wyant—These burners are used for heating pipe used for pipe coils. In the case of large coils 18 or 20 such burners are in use at a time around the coils, and it is, therefore, very desirable to use the least possible length of hose.

The Secretary—One device which I knew of recently, that I had not seen before, was the use of gas burners for illuminating a projecting sign over a store front with a separate pilot light, so that the operation of them was practically reduced to the basis of electricity. The man just turns on and off his burners, and the companies do the rest. They go in there occasionally and renew the mantles and glassware of the burners. The question comes how much it will cost to renew those mantles and the glassware. This same store has an illuminated front for the basement windows, under the show windows, behind which are burned some gas burners to get the illumination. Another case I know of is where a barber's illuminated sign is lighted by an incandescent gas mantle, and, as far as I know, with very little trouble from blowing out.

The President—Thank you, Mr. Gifford. Mr. Evans, you have a device at home that you are using. What can you tell us of it?

Mr. Evans—I have had some personal experience with the coke arrangement mentioned previously. It has been in use since last fall, and seems to work satisfactorily. It is fitted to a water back, and we have no difficulty at all in getting plenty of hot water for bathing purposes, but as for heating the kitchen in very cold weather I am not sure that it is altogether a success. The kitchen of my house is rather exposed, with no storm doors. In the morning it is rather cool, but through the day it heats up nicely. The trouble is I have been using coke entirely, and the firebox is hardly large enough to hold enough coke over night and allow any draft to be put on. I have to bank the fire, in which case very little heat is radiated. However, it seems to me this device would help the sale of gas a good deal, in that people would use it for cooking in the winter time instead of going back to the coal ranges, relying upon the coke attachment for supplying hot water and keeping the kitchen warm.

Mr. Africa—Another device comes to my mind. One of our plumbers has fitted a number of water boilers. A great many families have a small copper tank, which is bricked in and used for boiling clothes. The ordinary way is to burn wood or coal under it. He has fitted them up with gas burners. It works very satisfactorily.

The Vice-President—I would ask if the Committee on the President's Address is ready to report.

Report of Committee on President's Address.

Captain McKay - Mr. President, the Committee to whom was referred the President's Address reports as follows:

Your Committee subscribes to the recommendations therein made, relative to the need of establishing a universal standard and methods of testing for illuminating power.

We concur in recognizing that the value of the services of employees should steadily increase with length of term of service, and we note with satisfaction the recorded extension of the practice by corporations who reward fidelity and efficiency by sharing with their employees the profits of their united industry and faithfulness.

Your President has emphasized anew the need of continual vigilance, and he has most opportunely urged that all engineers be alert to inform themselves of the current construction at home and abroad, and that a concerted endeavor be made to increase the returns from by-products, wherein lies great promise.

Your Committee suggests a discontinuance of the practice of referring the President's Address to a Committee, and respectfully recommends that the annual address be treated in the same manner as other papers prepared for the meeting. Few papers receive more thoughtful care in their preparation, and the Association should have the additional advantage of a full and free discussion of the questions considered and the statements embraced in the President's Address.

W. E. McKay,
W. A. Learned,
W. A. Wood,
} Committee.

The Vice-President—Gentlemen, what action will you take on the report of your Committee?

Mr. J. J. Humphreys—I move that it be accepted and its recommendations agreed to. [Adopted.]

The Association then adjourned till 2:30 P.M.

First Day—Afternoon Session.

The Association reassembled at 3 P.M., President McGregor in the Chair.

The President—As there is considerable to be disposed of this afternoon, we will make an attempt at a start by asking a question:

"Does a 'work-hard' meter register fast or slow?"

Capt. McKay—Mr. Spear has a great deal of data on that question. He could give you a complete answer.

The President—Thank you, Captain McKay, for the suggestion. As he is not present, suppose we pass that question. Another question is:

"What is the net result of the increasing use of pilot lights?"

The Vice-President—I can give some information on this subject. We have a record of tests of pilot lights, and I will give you some of the figures. We found the following result in a test made to determine the amount of gas consumed by the by-pass of single mantle

burners, as registered by meters which had been in service; that is, not new meters. The test covered a period of 12 hours. The by-pass used in the test was the kind fitted on the Welsbach or other make of single mantle burners. In the table following is shown the size of the meter, length of time it had been in service since the last test, the test on removal from service and the amount of gas consumed by the by-pass burner as registered by the meters:

Size.	Test of Meter: In Service.	Test of Meter: On Removal.	Amt. Registered.
5-light.. ...	2 yrs. 6 mos.	O.K.	0 c. f.
5 "	6 mos.	4.8 pr. ct. slow.	0.25 "
3 "	9 mos.	O.K.	0 "
3 "	1 yr. 10 mos.	O.K.	0.75 "
5 "	3 yrs. 10 mos.	1.2 pr. ct. slow.	1.30 "
5 "	1 mo.	1.0 pr. ct. fast.	0.12 "
5 "	4 mos.	1.5 pr. ct. slow.	0.50 "
5 "	1 yr. 6 mos.	1.0 pr. ct. fast.	0 "
3 "	2 yrs. 11 mos.	O.K.	0.75 "
3 "	1 mo.	0.8 pr. ct. fast.	1.00 "
5 "	9 mos.	1.0 pr. ct. fast.	0.60 "
5 "	8 mos.	1.2 pr. ct. slow.	0.50 "

An average of .96 cubic foot per meter per 24 hours. The by-pass burners tested on a test meter consumed 1.86 cubic feet to 2 cubic feet per 24 hours, showing a loss to the Company of (2 feet, less .96 cubic foot = 1.04 cubic feet) 1.04 cubic feet per by-pass per 24 hours. One thousand single by-pass burners in use would mean a loss of 1,040 cubic feet per day. If there were several by-pass burners consuming gas through the same meter the probabilities are that the meter would register more nearly correct. We tried several of these meters that did not register anything with one by-pass, but with two or more by-passes in use the meter moved some. Although the loss per year on 1,000 by-pass burners would amount to 379,600 cubic feet, yet the convenience to our customers through the use of these burners must hold for us more than enough business to make up for the loss. The lesson to be drawn from these tests is to endeavor to have more than one by-pass burner on each meter.

Mr. Barnum - I think the question of whether the net result is a benefit to the company comes in the question of making the lights adaptable to the people who want to use them. They will use the lamps when they can be adapted to their use, and the pilot lights make them so.

Mr. Gardiner—Mr. Africa's tests show in a very much more comprehensive and accurate way the results of some tests and experience I had some 4 or 5 years ago. In a company selling gas at $1 per 1,000 I thought it would be a good plan to stimulate the use of by pass and pilot lights, for the reason that, first, it would be good for the service, in that it would improve it, and the customers would like them if they could get them cheap enough, then from the company point of view, the revenue point of view, the large volume of sales to be obtained in a small way individually would increase the total of sales appreciably. Furthermore, the point I had most prominently in mind was that this load in the aggregate came non-coincident with the peak, and was long-hour burning; it was a 24-hour load. The pilot lights were submitted to quite careful test, and showed that the meters on the average registered only 60 per cent., or a little better than the figures obtained by Mr. Africa, and was, therefore, equivalent to selling gas at 60 cents per 1,000. In view of that we did not see our way clear to pushing the campaign at that time. I don't know whether that was wise policy or not. I am a little inclined to think it would have been wise to push the campaign, nevertheless.

Col. A. P. Browne—I did not hear the course of this discussion. In my own house I have 3 pilot lights. I watched them from about 9 o'clock Sunday morning, until 4 o'clock in the afternoon, before there was any possibility of using any gas in any other way, and did not notice the slightest movement in the meter. Three pilot lights were burning for those 7 hours.

The President—These are all interesting experiences. Mr. Hinman, have you anything to say?

Mr. Hinman—It seems to me a good plan for those using pilot lights to look after their meters and keep their valves tight. If they did they would get better registration. Every meter manufacturer sends out meters that will register with a pilot light, when the meter is new, and if the valves are kept clean it will continue all right. It would also seem that a meter with large valves was not desirable when pilot lights are used. The increased capacity of the meter would not come in, and it could not be used to advantage with pilot lights, because, of course, there is so much more chance for leakage with large valves than with small.

The Secretary—I would like to ask Major Hinman how long he thinks most meters would keep their valves tight enough to hold one pilot light?

Mr. Hinman—It depends entirely on the gas that is sent through. It might last a week or it might last several years. It would depend entirely on what the gas was. I have tested meters that had been in use some 20 years and still had tight valves.

The President—Has the last word been said on that matter? If so, we will return to the question we started with, and I would ask the Major:

"Does a 'work-hard' meter register fast or slow?"

It comes right in your line, Major.

Mr. Hinman—I don't think I quite understand the question. Does "work-hard" mean that it is passing a large amount of gas? If it does, it simply means it depends on the way the meter was originally set. You can adjust a meter so that it will be correct on all rates, or if the adjustment is not careful, it may be correct at the legal rate, yet if it is passing a large amount of gas or a small amount, the registration may be incorrect, either fast or slow. It depends on the adjustment. If the question means that the meter is stuck up it would be liable to go slow.

The President—I think in all probability that fully covers any answer to that question. If there is nothing more to be said on that we will proceed to the paper on

THE DISPOSAL OF COAL TAR,

by Mr. Carroll Miller, of Pittsburgh, Pa.

[For the text of the Miller paper, see JOURNAL, March 23, p. 489.]

An addition to Mr. Miller's paper giving matter not concluded in the paper as printed before the meeting is appended:

Just before I left Pittsburgh I saw in "Progressive Age" the following, which goes to further emphasize the use of creosote:

"Those of our readers who have structures supported by piling in sea water will know what marine borers are which honeycomb the wood and finally make replacement necessary before the natural life of the pile. Circular No. 128, of the Forest Service of the United States, Department of Agriculture, Washington, D. C., says that the only effective, practicable general remedy is creosoting. Since creosote is a coal tar product, and railway ties are now similarly treated, it would seem to the advantage of gas companies to encourage creosoting. Lumber is rapidly becoming very valuable, and, therefore, its preservation a necessity, exceeding in importance the cost of such process. It may stimulate the tar market appreciably."

At the same time a report from the Connellsville district was brought to my attention. During 1907 nearly 20,000,000 tons (2,000 pounds each) of coke were produced in that vicinity, which would be equivalent to more than 25,000,000 tons of coal. If this coal were coked in by-product ovens, in addition to the coke, the following could be obtained:

Gas.	75,000,000,000 cubic feet.
Tar	170,000,000 gallons.
Ammonia.	130,000,000 pounds.

Assuming 15 cents per 1,000 for the gas, the equivalent in heat units of natural gas at 25 cents, 2½ cents per gallon for tar and 6 cents per pound for ammonia, the income from these three items would amount to $23,300,000, or nearly $1 per ton of coal. In order to be on the safe side I have used low figures for both the amounts and values of the by-products. If the tar were distilled and sulphate of ammonia manufactured larger profits would be realized.

Discussion.

The President—A capital paper indeed, having a great many good points that can be brought out by discussion. I would like to hear from Mr. Barnum.

Mr. Barnum—Is the benzole that can be recovered from the tar used to enrich gas just as it is recovered, and what is the process of recovering it?

Mr. Miller—Shall I answer that now, or afterwards?

The President—I think the chances are that Mr. Humphreys will come in.

Mr. J. J. Humphreys—I want to know approximately the cost under general conditions of briquetting per ton.

The President - Any other questions, Mr. Gifford?

The Secretary—I would like to ask Mr. Miller about the reference to production of sulphuric acid from the spent oxide, whether that is generally used.

The President—Well, Mr. Miller, I think the questions are all asked, otherwise they would have been asked by this time; so will you kindly proceed to answer them.

Mr. Miller—In reference to Mr. Barnum's question about benzole from the light oil, you can get 90 per cent. benzole, 50 per cent., and also different grades of naphtha, the proportions depending on the quality of the tar. The 90 per cent. benzole is the best tar product that I know of with which to enrich gas. Mr. Humphreys asked the price of briquetting in Germany. I have some data, but none with me. I cannot remember the figures, but will supply Mr. Humphreys with the information some of these days. Regarding sulphuric acid from the spent oxide, they use the same process as in any other system of manufacturing sulphuric acid (from pyrites or any other source of sulphur), except that the furnaces for burning the oxide are constructed differently. When I was in England about 10 years ago one of the London Companies was just building a sulphuric acid plant, and using nothing but spent oxide for making sulphuric acid, with which sulphate of ammonia was manufactured. I have heard since that the plant is very successful. Other English and Continental Gas Companies are doing likewise. The iron is recovered afterwards, and I believe is used to make oxide again.

Captain McKay—Mr. Miller referred to the percentage of sulphur in the discarded oxide as 50. Can we learn whether that agrees with his own practical experience at gas works, that it generally contains 50 per cent. of sulphur when discarded, and does that agree with the conditions as known in other works? Moreover, assuming that 50 per cent. of sulphur is in the oxide that is discarded, how many times, on the average, has such oxide been used in order to raise the percentage to that high figure? What is the percentage of sulphur, of which Mr. Miller has any knowledge, taken up on one use of oxide?

Mr. Miller—I think 50 per cent. is a fair amount. In a good many works with which I have been connected, I have found 50 and as high as 60 per cent. of sulphur. I think the length of time that you can afford to run your oxide depends to a great extent on the size of the boxes. I read a paper before this Association on the proportion of sulphur removed in each purifying box—I think it was 8 years ago, and I gave, with the certain speed that the gas was going, the amount of sulphur that each box would remove. On the other hand, if your boxes are very small, overworked I may say, then you cannot afford to let your oxide get so foul, because it is relatively not so efficient in removing the sulphur. So I could not say just how much or how little you can afford to remove. Captain McKay probably knows more about that than I do. How much have you taken out, Captain?

Captain McKay—It is a great pleasure to us to have Mr. Miller here. It is 8 years since he read a paper here, and we have been looking for his return during those 8 years.

Mr. Miller—But I have been abroad most of that time. I think I have done pretty well in that line, when the circumstances are considered.

Captain McKay—Mr. Miller did not tell us the maximum percentage of sulphur that, under the most efficient normal working, oxide could be expected to take on between changes, from the time it is put into a box until it is taken out. What is the maximum that anyone could expect to get? Would you expect 10, 15, 20, 25 percentage of sulphur?

Mr. Miller—I have known cases where it would be necessary to change daily, and I know of an isolated case where the oxide was entirely exhausted in one change; that is to say, about 50 per cent. of sulphur. It so happened that the latter was a plant where the purifying capacity was extremely large in proportion to the make of gas. But I think that in the normal size purifiers probably your oxide would be exhausted in 5 or 6 times; that is to say, it would take up between 8 and 10 per cent. between changes. However, at the moment I do not remember any definite figures.

Captain McKay—While you are speaking, Mr. Miller, will you go a step further and tell us what is the minimum sulphur you have ever discarded oxide for?

Mr. Miller—I think it depends a good deal on labor. When the cost of labor for taking the oxide out and putting it back in the box gets too high, then it is time to discard that material.

Captain McKay—Well, labor is cheap in Japan. How is it then?

Mr. Miller—When I left Japan we had not been running the works long enough to exhaust the oxide. I do not want to take up your time by describing Japan, because you can get a much better description out of a guidebook than I could give you, but it is very interesting to note the way they change the oxide in the boxes. The boxes are 7 feet 6 inches deep, the gas going in the middle, separating, and going to top and bottom. About 20 laborers were used. Each man carried a pole on his shoulder, and on the end of the pole is a basket, of a capacity of about one-half bushel. There would be a continuous stream of these fellows going back and forth. They would fill up the baskets, dump them, and come back for another load. With 20 or 30 of those men you could get a box emptied and filled again in a day. Those coolies get from 20 to 25 cents a day, so labor is very cheap. We did not need any labor saving apparatus in the purifying plant. However, considering the cost of living and the amount of work done by one man, labor in Japan is not so cheap as it would appear.

The Secretary—I would like to call the Association's attention to the fact that the Captain did not answer Mr. Miller's question.

Captain McKay—What was Mr. Miller's question?

The Secretary—How much the Captain was taking out of his boxes?

Mr. Miller—Mr. Gifford told me to ask you that.

The Secretary—I am willing to father it for the sake of getting it answered.

Captain McKay—At one of our plants we are taking out 3 tons of sulphur a day, so naturally I am very much interested in all the information we can get from Mr. Miller, to whom we look as a guidebook through the purifiers.

The President—Gentlemen, is there any other question you would like to bring up before this matter is finally disposed of? I think Captain McKay exhausted the subject about as fully as anyone could.

Mr. E. C. Brown—Will you allow me to add a word?

The President—With pleasure.

Mr. Brown—I am very much impressed with the paper of Mr. Miller. It points in the right direction. I am especially impressed with its closing sentence, which prompts me to say that those of you who are acquainted with the excellent reports issued by the Department of the Interior, Washington, under the auspices of Prof. Edward W. Parker, which deal with statistics relating to the amount of coke, coal tar products and ammonia, must recognize the great value to our industry of these reports. We have always regarded them in our office as possessing exceptionally valuable matter. I learn that the Government contemplates discontinuing the issuance of these statistics because of the fact that it has been unable to get the information in the detail necessary from the gas company managers of this country. I think in no case have the reports covered returns from more than 350 companies It seems to me this is an appropriate time to call to the attention of so many gas engineers as are here assembled the situation, and to ask everyone present to endeavor to induce the Government not to give up the issuance of the referred to reports, which are the basis of so many important features of our industry; for we all recognize that good, reliable statistical matter is what we all stand in need of to guide us safely in our affairs. I think this Association can do a great deal, if it is so disposed, to induce the United States Government to continue these very important and valuable reports.

Mr. Miller—I certainly approve of what Mr. Brown says. Very few people seem to know of the great amount of literature that is printed in Washington. The officials are very accommodating and seem to be pleased to give the pamphlets to anyone who asks for them. I think it would be a great misfortune if this literature were no longer distributed.

The President—The point is very well taken. I would like to say to Mr. Brown that we are one of those 350 companies that promptly made the return to the government, inasmuch as I believe it is a great help. Whatever you may decide in regard to it, you can report tomorrow and then take appropriate action.

Captain McKay—One other question I would like to ask Mr. Miller. He referred to the amount of $2,500,000 represented by the products being wasted in the air in the Connellsville region. What capital in millions, in round numbers, would be required so to change the form of manufacture of the coke, preserving the character of the products of coke ovens just as they are, what additional capital would be required to save to the Connellsville region this $2,500,000?

Mr. Miller—I do not think that is a question Captain McKay ought to ask. He is operating coke ovens. He knows how much they cost.

Captain McKay—We are not making Connellsville coke.

Mr. Miller—But you are making a coke equally as good, considering the coal you have. (Laughter). It has been a mooted point among the blast furnace men in regard to by-product oven coke, but I think that many of them now agree that the by-product coke is just as good in blast furnace practice as the beehive. The principal difference appears to be in the appearance of the coke, the beehive coke being bright and silvery. As near as I can remember, the cost of a by-product coke oven plant would be in the neighborhood of $1,000 per long ton of coal daily capacity. Of course, those figures that I

have given, twenty-odd million of dollars, are figured pretty low. If we could get the gas in this neighborhood, then you would sell it for $1 or whatever the price is in Boston; 85 cents, sliding scale now, I believe.

Captain McKay—I will correct that. The highest price is 80 cents.

Mr. Miller—What dividend?

Captain McKay—Eight per cent., we hope. Mr. President, I was induced to ask that question on a second perusal of this paper, and I would like to state what a satisfaction it has been to me personally to have the papers at this meeting made up, printed and prepared, in the form in which they are given to us. I think that it has added very much to the immediate value of the papers, and to the possibility of our carrying on intelligently with the reader the paper and also the discussion. I think that the Secretary is to be congratulated on the way in which he has gotten these together. [Applause.]

The President—It is kind and gracious of Captain McKay to express himself so much to the point, and if the Secretary will stand up and make his bow I think possibly the Captain will be thanked.

The Secretary—While I am up making that bow I would like to move a very hearty vote of thanks to Mr. Miller for the presentation of his paper, which I think will be useful hereafter as well as now.

The President—Does Captain McKay second that?

Captain McKay—Heartily. [Adopted.]

The President—Mr. Miller, it gives me great pleasure to convey to you the thanks and the appreciation of the Association for the very valuable paper that you have contributed.

Mr. Miller—Thank you. And I would like to say I hope one of the members, if any of them are distilling tar at their gas plants, will write a paper and give us actual experiences. I have given results from other countries. I know of but one gas company that is distilling tar in this country; but if you can induce its manager to give us some of his results I think it would help along considerably.

The President—I think it is a very sound suggestion, and a very welcome one, to our incoming President. I think without stepping very much on his domain that he will bear it in mind. As a continuation of this same paper, or as an addition to the matter submitted, Mr. Barnes, of New Haven, will contribute something.

Mr. Barnes—Mr. President, I do not feel prepared to talk on this subject. Yesterday as I left my office I noticed this sample of macadam road on my desk, and brought it up to this meeting as a matter of interest. This sample of road was treated with tar in September of last year. The New Haven Gas Light Company, in the year 1906, experimented with a stretch of road, 750 feet long and about 50 feet wide, in New Haven. We splashed tar onto this road in a crude way, heating the tar to 160° F., and then covered the road with the dust we had swept off. The results were not satisfactory. The road was not properly treated, and not being paved the full width the dust from the unpaved portion prevented us from obtaining the desired results as a dust layer. In the early part of 1907 we went into the town of Orange and treated a stretch of Macadam road, which had been laid for 2½ years. The road was already swept bare by the automobiles that were constantly going over it. However, we reswept the road with corn brooms, taking the surface off down to the No. 2 stone. We then applied tar heated to 190° F., splashing it on with dippers and working it in with corn brooms (we did not do this in the previous year). We then spread screenings or splinters of trap rock, with the dust removed. The covering was approximately ¼ inch in thickness. The road was then open to traffic. This road has now been open 8 or 9 months and is practically in the same condition as it was when we left it. It has been very highly spoken of by automobile users passing from New York to Boston, so much so that the Technical Committee of the A. A. A. tried to interest us in the laying of the road on Long Island speedway, but I think that has fallen through (the speedway, not the tar proposition). During this time we have been working with the Permanent Pavement Commission of New Haven endeavoring to get them to specify a tar treatment on all macadam roads that were laid. This is now being done, but in only 2 cases have the bids been awarded, for the reason that the bids have brought the price of the roads above the appropriation. In September of last year we received the contract to treat Shelton avenue, New Haven, at 13 cents per square yard. This was a macadam road which had been laid 1 year. Our first preparation on this road was to use horse sweepers to take off the top surface and bare the No. 2 stone. We found that these did not work, the cakes being too hard for these brooms to break up. Therefore, we had to use hoes on the shoulders and hand brooms on all of the surface. We then heated tar in a kettle, which was on wheels with a firebox attached, and tapped in the side for a 2-inch pipe. On this pipe we placed a meter cock and a length of fire hose with a pipe flattened on the other end. This wagon was rolled along and the tar was spread through the flattened pipe ⅓ the width of the road, using about 1 gallon to the square yard. Unfortunately for us, this work was frequently interrupted by spells of rainy weather. Consequently the price of the short section, which we did at that time, is no criterion to go by for the longer section which we will take up this year. After the tar had been spread on this road it was covered with trap-rock screenings and rolled in with a 10-ton roller, after which it was opened up for traffic. This piece which I have here is a sample of the work done on this stretch of road in September. In November, one of our street inspectors came into the office and said, "Here is a piece of macadam road that I knocked out on the edge of a sewer ditch, which was opened up on Shelton avenue." Now this sample has been knocked around my office during this time, and has held together, showing that the tar has penetrated approximately 2 inches. Further in regard to the tarring of roads in Connecticut, State Highway Commissioner, Mr. James H. MacDonald, has written the following specifications for treating macadam roads, which he has charge of, during the year 1908. I think these specifications are very clear in what is necessary to do in treating macadam roads.

Specification for the Application of Coal Tar as a Preservative and Dust Layer on Macadam Roads.

Section 1.—The contractor is to furnish all tools and implements and all necessary material to carry out the meaning and intention of this specification.

Sec. 2.—This specification is for the purpose of applying a preservative and dust layer on the section of highway known as....., in the town of....., a distance of.....linear feet, or so much thereof as the sum of .....dollars will do. The State Highway Commissioner reserves the right to increase or diminish the number of feet, as the interests of the State may appear.

Sec. 3.—The contractor is to pare down all shoulders and shape all gutters in conformity with the cross section which appears in another part of this specification. All scrapings or cuttings, and any cleanings from the road, shall be deposited well back of the width established for the road, shoulders and gutters, in a neat manner and as directed or required by the State Highway Commissioner. After the shoulders and gutters have been formed and shaped, the contractor shall clean off all dirt or accumulations that are to be found on the travel path of the road, using split rattan brooms or a horse sweeper, and the sweeping shall be continued until the No. 2 stone is entirely bare or clean and free from all material other than that which is to be found in the No. 2 course, so that no interruption will occur between the tar and the No. 2 course of stone. If any toe marks, ruts or depressions are found on any part of the work the contractor shall thoroughly sweep out such toe marks, ruts or depressions, or fractures in the road, and shall build up any part of the road that is below the established grade thereof in its proper contour, using stone that has been previously completely covered with coal tar. The coal tar that is used for saturating the stone shall have about 15 per cent. of pitch melted into it, so that the pitch will become liquefied and will thoroughly mix with the coal tar, and this mixture shall be that which shall be used in covering the stone. The stone used for repair shall not exceed 1 inch longest diameter, and shall be placed in the depressions, whatever they may be, and thoroughly rolled into the original surface, but all toe marks, ruts, depressions or fractures shall first receive a slush treatment of coal tar before the application of stone is placed therein, so as to make an assimilation between the old road and the newly added material. All stone placed in toe marks, ruts, depressions or fractures shall be thoroughly rolled before any other application of coal tar is made, so that when the road is finished it will present a smooth and unbroken appearance.

After the cleaning has been done and all toe marks, ruts, depressions or fractures have been treated, as described, an application of coal tar shall be given the surface of the travel path of the road. The material with which this application is to be made shall be coal tar which has been heated to a temperature of 225°. When the required temperature is obtained, the coal tar shall be flooded on the road and broomed in with split rattan brooms. After this first coat of coal tar has become absorbed into the road, a second application of coal tar shall be made, the tar to be heated to the same temperature as the first coat, and applied in the same way and broomed in so that all interstices and voids will be completely filled.

Following closely on this second application of coal tar, the con-

tractor shall furnish and apply a treatment of chips, or splinters of stone, preferably trap rock. These chips or splinters shall range in dimensions from ¼ to ¾ of an inch, longest diameter. This covering or wearing surface shall be applied while the second coat of tar is hot, and shall be of a uniform depth of not less than 1 inch. Immediately after this course has been applied uniformly over the entire travel path and on top of the second coat of coal tar, the roller shall be run over this course of stone a sufficient number of times to thoroughly imbed this stone in the last coat of coal tar, and the rolling shall be continued until the inspector in charge of the work is satisfied that a sufficient amount of rolling has been done.

Special Requirements.

No water gas tar will be allowed to be used. Nothing but pure coal tar shall be used in the work.

No application of tar will be allowed on the road except when the road is perfectly dry.

No application of coal tar will be allowed except the day is dry and hot, so that the road will be in a receptive condition to receive the tar.

No application of coal tar will be allowed to be placed on the road until at least 24 hours after any storm. Nor will any coal tar be allowed to be applied on the road until the dew has thoroughly evaporated from the road.

In other words, the road must be thoroughly dry, free from moisture, and the day must be hot, so that the road will receive the full benefit of the sun. The road must be thoroughly cleaned, so as to be free from all loose material. The contractor, after he has applied the stone on the last coat of tar, and the road has been rolled, shall keep the road closed for 24 hours before allowing travel thereon.

All work shall be done in a thoroughly workmanlike manner, and all material shall be first-class, and as specified. All tools and appliances shall be thoroughly up to date so as to insure first-class work.

In addition to that, I asked the Commissioner the weight of the stone roller, and he said he was satisfied with a 4-turn roller, anything from 4 to 10 turns. [To be Continued]

[Continued from Page 514]

Working Standards of Light and their Use in the Photometry of Gas.[1]

[A paper read by Mr. Charles O. Bond, before the Franklin Institute.]

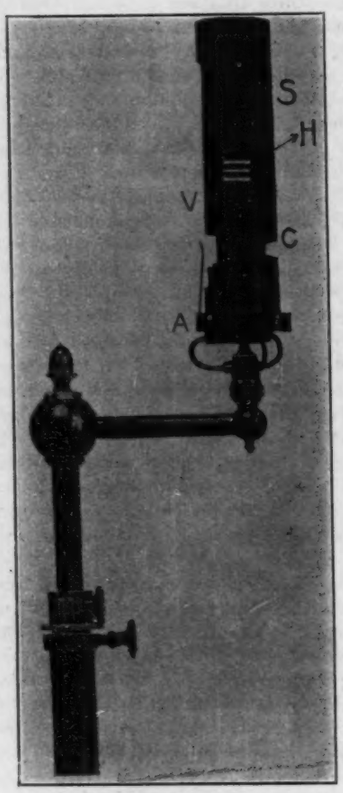

Fig. 1.—The Edgerton Standard.

B. *The Edgerton Standard.*—This is a development from the Methven screen, much used in England as a secondary standard. Methven claimed that if a coal gas flame burning in a Sugg D Argand burner was kept at a constant height of 3 inches, there was a zone in that flame which was of great constancy and brilliancy. He erected a screen about 1½ inches in front of the axis of this flame containing, at the height of this zone, a slit about 6 mm. wide and 25 mm. high, through which a light of 2 candles was supposed to issue.

The Edgerton standard burner consists of a Sugg D Argand burner, with a 7-inch by 1¾-inch chimney surrounded by a blackened brass sleeve. In the front of this sleeve with its lower edge ¾ inch above the top of the steatite ring of the burner, there is cut a slot ⅛-inch high and of such width as to include the entire diameter of the flame. The theory of the standard is, that if the flame be adjusted to a height of 3 inches the horizontal section visible through this slot will remain practically constant in candle power for ordinary variations in the illuminating value of the gas supplied to it. The sleeve in the rear of the flame is also cut away so as to prevent interior reflection from it, and small side slits are cut in the sleeve at the proper height to observe whether the flame is kept constant at 3 inches height.

Edgerton seems to have made an improvement on the Methven screen in having his slit disclose the entire diameter of the flame instead of only partially doing so; for the radiant center of the Methven standard is not in the plane of the slit, nor does it lie at the geometrical center of the flame, but it changes for each change in the distance of the photometer disk from the standard.

If, in using a screen through which a standard light is to issue, the aperture be made very small, the radiant center of the light may, without appreciable error, be considered to lie at the slit. If, however, the aperture be somewhat enlarged, and if the photometer disk he placed quite near, as it would be with the light of only 2-candle value given by the Methven standard, then as the disk was moved closer the dimensions of the section of the flame exposed would increase both horizontally and vertically.

In the case of the Edgerton standard the whole diameter of the flame is exposed, and the only increase in sectional area would be in a vertical direction. Also, as this standard gives more than twice the light of the Methven, the error from this cause would be reduced by the greater distance of the photometer disk. As a matter of fact experiment has proved the radiant center of the Edgerton standard to lie $\frac{9}{10}$ inch in front of the geometrical center of the flame, and the same result was deduced by formulæ worked out by Prof. Jacobus, of Stevens Institute.

In using the Edgerton, therefore its geometric center is placed $\frac{9}{10}$ inch back of the usual standard line, and it is standardized in this position.

Some experiments showing the light value of the Edgerton Standard under different conditions are detailed in a paper by Mr. Rollin Norris, published in the 1899 Proceedings of the American Gas Light Association. The fuel supplied to this standard was either straight coal gas or straight carburetted water gas, but not a mixture. When water gas was used, the value of the standard varied from about 5.70 to 6.30 candles; when coal gas was used of a candle power as shown on a flat flame burner as being between 13 and 17, the value of the Edgerton varied from about 4.20 to 4.60. It is evident that a mixed gas would give values, uncertain with varying proportions of the mixture, falling between those figures.

When water gas was used there seemed to be no fixed relation between the candle power of the fuel supply and the value of the standard resulting; when coal gas was used there was an increase of about $\frac{1}{10}$ candle in the value of the standard for each candle increase in the value of the gas supplied. The effect of variations in the flame height may be seen from the following data:

Height of flame in inches.....	2.5	2.75	3.00	3.25	3.50
Average candle power of Edgerton standard.	6.52	6.42	6.31	6.21	6.11

Mr. Norris concludes that with either coal gas or water gas, if the Edgerton be carefully standardized for the conditions under which it is to work, it may be relied upon to give results whose error does not exceed 1¼ candles, while a large majority of the observations will be correct to within 1 candle of the true value of the gas.

In the use of this standard it is imperative that the chimney shall be kept clean and that the calibrated section of it be always presented to the opening in the screen. As the sleeve completely surrounds the glass chimney the latter gets much hotter than if it were exposed to the air, and if by neglect the flame lengthens for a time so as to fill the chimney, it is likely that the glass will be melted down.

The simplicity, ease of operation, cheapness of maintenance, and rapidity of preparation of this working standard have in the past made it very popular about gas works. It has been valuable in direct proportion to the care taken to make and keep it accurate. Many works have it in position and standardize it frequently from a pentane lamp. If coal gas can be furnished to it through an averaging tank to prevent large and rapid changes in the quality of the gas, it forms a valuable adjunct to the operating department.

C. *The Hefner Lamp.*—This standard is little used in America among gas companies, and personally I am not as yet familiar with its operation. Without doubt this lamp has been described before this Institute already. The literature relating to it is full; it has been more thoroughly investigated than any other light standard, and is the equal in reproducibility of any of them. It is simplicity

1. *Journal of the Franklin Institute.*

ilself, and readily portable. The greatest credit is due to those scientists in Germany who have perfected its construction and method of operation. Yet there would seem to be good reason for its non-adoption as a *working* standard in America. It is, first of all, a primary standard of light, that standard being the German unit and not the one which we follow. It has a value even less than that of our candle, being about $\frac{9}{10}$ of it, and our candle used singly is too small for working purposes.

With a magnifying flame gauge the Hefner flame height is set at 40 mm., for the lamp is constructed to be normal at a stated height of flame and not for a stated consumption of fuel. This height is difficult of attainment, for the flame tip is very pointed, and eyes differ in its observation; an error of 1 mm. in flame height causes an error of 2.5 per cent. in the light emitted. The flame, moreover, is of a distinctly reddish color, less suited to match the gas flame in disk comparisons than is the candle flame. It is very sensitive to drafts; more so probably than candles on account of the obstruction which its base presents to a vertical flow of air currents to the flame; and as accurate flame height is the great desideratum this objection becomes more important than it otherwise would be.

The lamp is operated with a wick, which is adjustable in height and which supplies the fuel, amyl acetate, to the flame.

E. *The Elliott Lamp.*—This lamp was contrived by Dr. A. H. Elliott, of New York city. It is the adaptation of the student lamp principle to the purposes of a secondary standard, the fuel used being a high grade of petroleum, usually Pratt's Astral oil. The wick is flat, and a screen is placed close beside the flame with an opening of the requisite dimension to permit the passage of a 10-candle light to the disk. The glass chimney is large, round and bulbous, so as to allow the presence of the screen inside it without undue deflection of air currents. The screen being placed so near the flat flame and its opening being of relatively large size, the standard does not require a similar correction for radiant flame center as does the Edgerton standard.

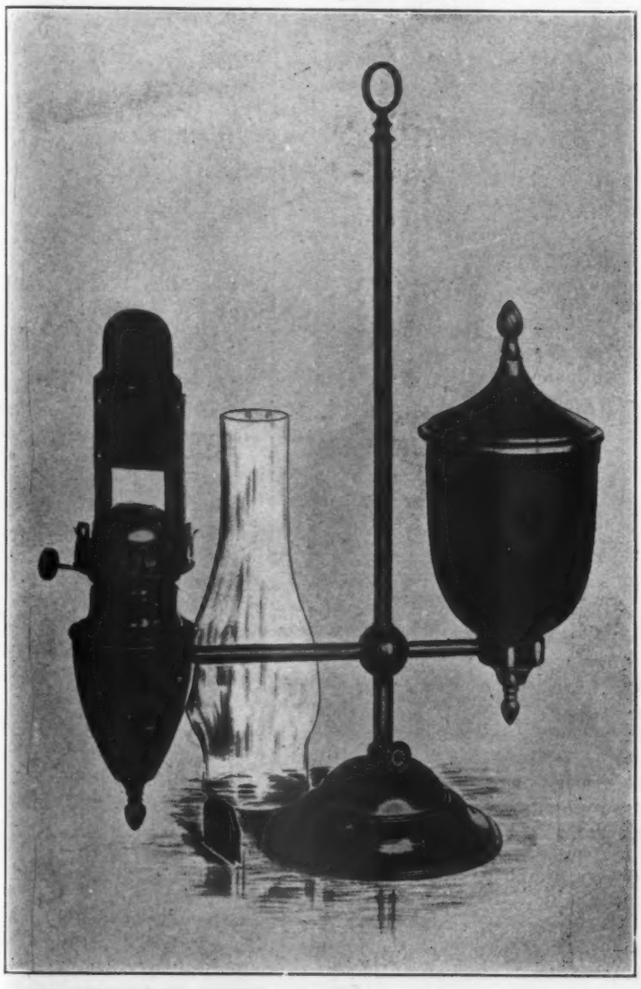

Fig. 2.—The Elliott Lamp.

The lamp is painted black, and has an acorn-shaped reservoir capable of holding about 500 c.c. of oil and the rate of consumption of oil when burning normally is about 1 c.c. per minute.

The wick is 1¼ inches wide, and instead of being trimmed horizontally across its entire top, the two corners are cut diagonally, leaving a horizontal top of 1 inch. This has the effect of producing a flame with a level top and vertical edges. A tin form is supplied which fits snugly over the end of the wick, indicating the direction of trimming. The trimmed end is then lightly touched with a flame while still dry, to singe off the unevenness and fluff occasioned by the scissors. The wick is then placed in position and run up and down the channel its whole length to make sure it works freely. The reservoir is then filled and after about 5 minutes the wick is saturated and ready for lighting.

The burner is provided with an extra high dome through which the flame issues, and to this dome is attached a screen, consisting of three parts: Two uprights at the sides with a space of 1¼ inches between them, and an adjustable plate connecting them above. This plate is 4 inches high and its lower edge is set at a height of about ⅞ inch above the center of the dome. The screen is made adjustable in a vertical direction so as to permit an increase or decrease in the exposed length of flame necessary to produce 10 candles.

The lamp having been lighted and chimney placed, the wick is then turned up until the opening in the screen as observed from the photometer disk is a luminous whole with the exception of the blue flame at the bottom. Right here the greatest care must be observed to get a level topped flame. After burning 20 minutes so as to gain thermal equilibrium the lamp is ready for standardizing and subsequent use. It should not be touched again, and it will continue to give a remarkably constant light until the reservoir is depleted. If exactness in the preparation and manipulation of the wick is observed the lamp is fairly reproducible at 10 candles for a limited time. It is claimed that a wick will last about 200 hours before capillarity is impaired, but the usual errors incident to the use of the same are soon encountered, and the safest method is to standardize the lamp frequently.

Following are light values obtained over a considerable period for the Elliott lamp as compared with a pentane lamp, the above method of adjustment being used:

Date.	No. Readings.	Value.
3/23/'07	11	9.945
3/25/'07	18	10.044
3/26/'07	36	10.292
3/27/'07	16	10.194
3/28/'07	36	10.11
	117 Average.	10.117

Another series of readings was begun on April 17 lasting until April 23, a total of 550 readings being taken, and the average value given the lamp, the positions of the contrasted lamps being reversed half the time was 9.957. The lowest value was 9.76 and the highest value was 10.21.

An experiment to determine the error introduced by disturbing the height of the flame was made:

	Correct Height.	¼Inch Low.	¼ Inch High.	½ Inch High.	Correct Height.
Value vs. pentane lamp..	9.922	10.172	10.647	11.243	9.831

This shows most forcibly the necessity of having the wick so trimmed as to have a level top to the flame for accurate adjustment. If such care is given the lamp it may be classed as equal to the Edgerton standard (with the further advantage of having an independent fuel supply) and as better than the candle for secondary work.

During the summer of 1907 the Elliott lamp and the pentane lamp were subjected to the influence of vitiated atmosphere in a closed room. The loss in illuminating value was attributed in each case to vitiation, though of course by the use of proper apparatus it would have been possible to separate the effect of the carbonic acid, the water vapor and the diminished oxygen effect. In reality these effects are always present together and it would seem that the inclusive term "vitiation" is more proper, and that the CO_2 content is a fair measure of it.

In these tests the Elliott lamp and pentane lamp having approximately the same value, suffered about equally for a given per cent. of vitiation, while the candles suffered much more.

F. *The Pentane Lamp.*—While something has been said of this lamp under the discussion of the unit and primary standards, it is proper that an instrument of its importance in the world of physics should be accurately described, both in construction and operation. I quote from W. J. A. Butterfield's extract from the Referees' Method:

"Air is saturated with pentane vapor by passage through a saturator, which is about two-thirds filled with pentane, and the air gas so formed descends by its gravity to a steatite ring burner. The saturator is 184 mm. square and 38 mm. deep, and contains seven partitions soldered to its top, and alternately meeting either side and stopping 25 mm. short of the opposite side. The air is thus compelled to pass eight times across the saturator. A piece of India rubber tube, 13 mm. wide internally, conveys the air gas from the saturator to the burner. The air inlet pipe to the saturator, and the air gas outlet, are provided with stop cocks, and the height of the flame is controlled by the outlet cock. A brass chimney 431 mm. long, 30 mm. inner and 32 mm. outer diameter, is placed so that its lower end when cold is 47 mm. above the steatite burner. This chimney tube draws the flame to a definite form and hides the top of it from view. A mica window in the tube allows the tip of the flame to be seen and the height to be regulated, so that the tip is somewhere between the bottom of the window and a crossbar. A tube, 290 mm. long and 50 mm. inner and 50 mm. outer diameter, surrounds the chimney tube and draws in air at its base. The chimney tube projects 65 mm. below and 76 above this outer tube. The heated air passes from the top of the outer tube to another tube 529½ mm. long and of 23 mm. inner and 25 mm. outer diameter, which is placed parallel to the first tube, and with its axis 67 mm. distant from the axis of the latter. From the bottom of this tube the air passes to the center of the steatite ring of the burner. The outer diameter of this ring is 24 mm., the inner diameter 14 mm. and there are 30 holes, each 1.25 mm. in diameter. A conical shade 102 mm. wide at base, 55 mm. wide at top, and 57 mm. high, having an opening 34 mm. wide, is placed around the flame. The light which serves as the 10-candle standard passes through the opening in this shade. Leveling screws are provided, by which the lamp is adjusted until it is vertical, and the height of the steatite ring (when using the Table Photometer) is 353 mm. from the table."

The American lamps differ from the English in details, but not in essentials. They have a metal tube instead of an India rubber tube to convey the pentane vapor from the saturator to the burner, as it was found that the pentane had a solvent action on the rubber. The vapor tube is also provided with a waste cock from which condensed vapor may be withdrawn if necessary; with a regulating cock capable of nice adjustment. It has a lower position for the crossbar in the mica window, American practice being to regulate the flame height with the top of the flame at this crossbar, while English practice regulates at a position midway up to their higher crossbar. The chimney centering screws of the American lamp are threaded through a split collar at the base of the outer chimney, and a stiffening band is placed around the inner chimney upon which the ends of these screws touch. This is to prevent indentation of the inner chimney by the screws as they lengthen by heating. The American lamp is made in such a manner that the burner is removable. The saturator box is fixed in position by three screws instead of being loose upon its support. The lamp is provided with a leveling platform, and with a plumb-bob directly beneath the burner center. The American lamp is heavier, due to the use of light brass castings in some positions instead of sheet work. The dimensions of the 2 lamps are identical, however, and after each has reached equilibrium, they are in very close agreement as stated earlier in this paper.

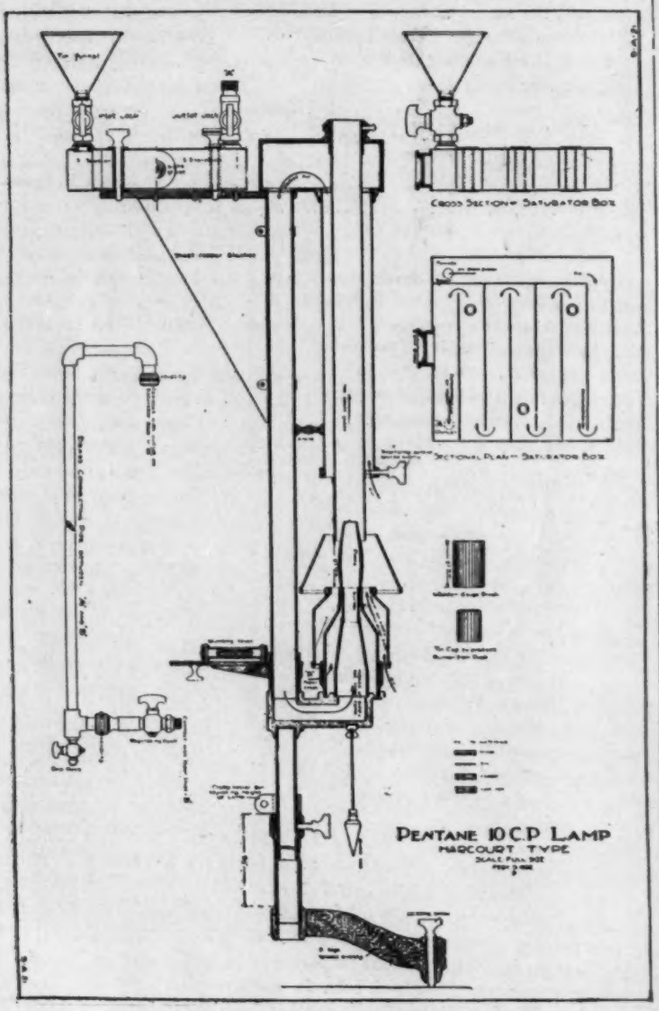

Fig. 3.—Sectional View 10-Candle Power Harcourt Pentane Lamp, American Made.

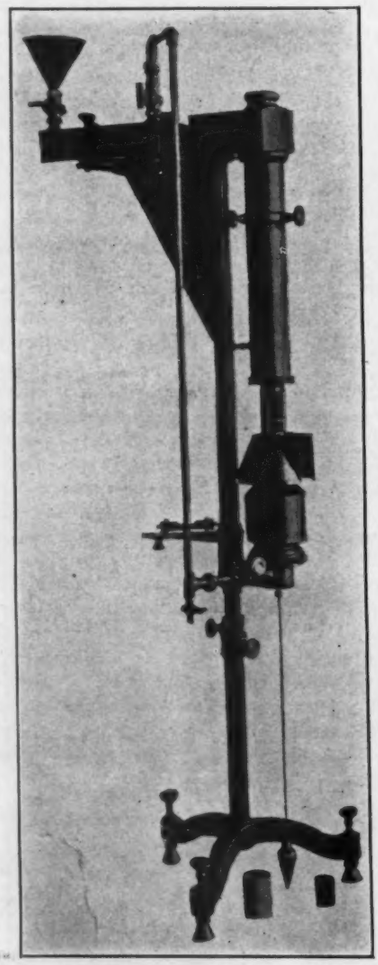

Fig. 4.—American Pentane Lamp.

Fuel.—The fuel supplied to this standard lamp is prepared as follows: Light American petroleum, such as is known as gasoline and used for making air gas, is to be further rectified by three distillations, at 55° C., 50° C. and 45° C. in succession. The distillate at 45° C. is to be shaken up from time to time, during two periods of not less than 3 hours each, with one-tenth its bulk of (1) strong sulphuric acid, and (2) a solution of caustic soda. After these treatments it is to be again distilled, and that portion of it to be collected for use which comes over between the temperatures of 25° C. and 40° C. It will consist chiefly of pentane, together with small quantities of lower and higher homologues whose presence does not affect the light of the lamp.

Testing the Fuel.—The density of the liquid pentane at 15° C. should not be less than 0.6235, nor more than 0.626 as compared with that of water of maximum density. The density of the pentane when gaseous, as compared with that of hydrogen at the same temperature and under the same pressure, may be taken. This is done most readily and exactly by Gay-Lussac's method, under a pressure of about half an atmosphere, and at temperatures between 25° C. and 35° C. The density of gaseous pentane should lie between 36 and 38, hydrogen being taken as 1.

Any admixture with pentane, of hydrocarbons belonging to other groups and having a higher photometric value—such as benzene or amylene—must be avoided. Their presence may be detected by the following test: Bring into a white stoppered glass bottle of from 80 c.c. to 100 c.c. capacity, 10 c.c. of nitric acid, specific gravity 1.32 (made by diluting pure nitric acid with half its bulk of water). Add a few drops of a dilute solution of potassium permanganate, sufficient to give to the acid a full and permanent pink color. Pour into the

bottle 50 c.c. of the sample of pentane, and shake strongly from time to time during 5 minutes. If no hydrocarbons other than paraffines are present, the pink color, though somewhat paler, will still be distinct. If there is an admixture of as much as ½ per cent. of amylene or benzene, the color will have disappeared.

This fuel is very volatile, requiring the tightest of cans for storage, and the storage place should be kept cool. When burning in the lamp it gives a soft, white flame, especially adapted in color to gas testing. The lamp must not, of course, be filled while lighted, or when a flame is near. It requires about 15 minutes to reach its thermal equilibrium, if the room be not too cold, when the flame may be adjusted and it will remain at a constant height. The room should be evenly ventilated to secure this result. One pint of pentane is sufficient for 6 hours' burning at normal height.

While putting pentane into the inlet funnel of the saturator, the outlet cock and waste cock will be kept open for a vent, but the regulating cock will be kept closed to prevent the accumulation of vapor and its condensate in the base of the burner. After filling close all cocks. When lighting, open first the waste cock, then the outlet cock, when the pressure in the saturator will be released and any waste vapor or air in the vapor tube will be discharged below the burner level. Then open the inlet cock, close the waste cock, and holding a lighted match over the burner, gradually turn on the vapor stream by means of the regulating cock. If any condensation has formed in the base of the burner, the first ignition will show a pointed blue flame playing lazily at the center of the burner. As the air supply increases this will turn to a greenish color and a small sharp explosion will result. The regulating cock will then be opened gradually until a proper ignition ensues, indicated by a steady, white, well-formed flame.

There cannot be two opinions by those who know, as to which of the working standards above described is best adapted for gas photometry of the accurate kind. In the Philadelphia Gas Works six pentane lamps are kept in constant use and have completely demonstrated their reliability.

As some interest attaches to the uncertain relations existing between the primary standards of England, France and Germany, I give below a table of these ratios taken from a Bureau of Standards Bulletin prepared by Dr. E. P. Hyde (1907).

Summary of Ratios of Hefner, Harcourt (10-Candle Power) and Carcel.

	Harcourt. Hefner.	Carcel. Hefner.	Harcourt. Carcel.
Reichsanstalt (using electric comparison lamp)	10.90	10.70	1.02
Laboratoire Central (using electric comparison lamp)	10.76	10.76	1.00
Laboratoire Central and Laboratoire d'Essais (direct comparison)	10.72	10.73	1.009
National Physical Laboratory (British) ..	10.95	10.69	1.024
Ratios computed from Bureau of Standards incandescent lamps	11.19	10.73	1.043
Best previous values (Bunte)	11.40	10.87	1.050

At the International Photometric Committee meeting in Zurich, July, 1907, the following ratios were adopted, it being understood that the normal water vapor-content for the Carcel and the Harcourt should be 10 liters per 1,000 liters of dry air and for the Hefner 8.8 liters per 1,000:

Carcel = 10.75 Hefners.
Harcourt = 10.95 Hefners.
Harcourt = 1.020 Carcels.
} Probable error + 1 per cent.

The Law of Electric Light Companies.

[By Mr. J. E. Brady, in *Elec. World.*]

In general, it may be said that electric light companies are liable to persons injured through their negligence to the same extent as are individuals and other classes of corporations. There is nothing inherently different in the nature of electric light companies which requires the application of different or unusual rules of law in actions for negligence where they are involved. The cases, however, very often present novel combinations of facts.

Liability to Employees.—There are general rules of law applying especially to the relation of employer and employee which govern the duties of electric light companies to their employees in the same manner as they regulate the obligations of any other employer; and, likewise, rules which prescribe the rights and obligations of the employees of such companies. Under these rules it is presumed that every person of ordinary intelligence has knowledge of the destructive forces of nature. If the work he performs exposes him to danger from these forces he assumes the risk of the injury. Every man of experience in handling live wires will be taken to understand that he must use great prudence. The authorities generally announce that if the servant has full and equal knowledge with the master that the appliances used are defective, and each is equally indifferent to the danger, they will stand on a footing of equality as to damages. In the first place, however, it is the master's duty to be careful that his workman be not induced to work under the notion that the appliances are safe, when he knows or has reasonable ground to believe that they are dangerous. On the other hand, it is the duty of every workman to execute the work assigned to him with required care, and not to expose himself to the liability of injury. In other words, the general rules which determine the liability of a master to his servant for injuries to the servant apply as between the electric light company and its employees. Smart vs. Electric Light Company, 47 La. Ann., 869.

In Colorado Electric Company vs. Lubbers, 11 Col., 505, the defendant company, acting through one of its superintendents, sent out a carpenter in the employ of the company with instructions to remove a lamp in one of the electric light towers, connect the wires with the circuit, and return with the lamp to the works. At that season of the year the usual time for turning on the current was 4:45 P.M. on clear days and 4:30 P.M. on cloudy days. It was about 4:15 when the carpenter commenced work, and, while he was engaged in detaching the lamp, the current was turned on, causing him to fall to the pavement, sustaining permanent injuries. The carpenter was inexperienced in the work he was ordered to do, and it was outside the duties of his regular employment. He knew that it was dangerous to handle live wires, but, on the trial of his action against the company for damages, he testified that he did not know what a "jumper" was and had no knowledge of its functions or use. It was shown that, subsequent to the accident, the defendant company posted notices at its works warning all employees engaged at work on its lines to quit such work at 4 o'clock each day, and not to resume without first notifying the officers at the works. A judgment was given for the plaintiff on the theory that he had a right to rely upon the assumption that the current would not be turned on earlier than usual, and that by not waiting until the usual time the company was guilty of negligence. It was found necessary, however, to reverse the judgment because of the admission of the evidence as to the posting of notices after the accident. The liability of the company was to be determined on what took place before and at the time of the accident. What it did afterward, in the way of precaution, to avoid future accidents, should not have been construed into an admission of a previous neglect of duty and should not have been submitted to the consideration of the jury.

In another case, the insulation having been burned off a portion of an electric light wire by lightning, a night lineman was sent out to investigate. He found the fault, returned to the station and had the current shut off from the circuit. He then returned to the pole near which the trouble was located and, by pushing the handle of a cut-off box on the pole, made it impossible for the current to reach that pole. Current was again turned on, lighting all the lamps on the circuit but the one in question. Shortly afterward, a night patrolman, not having knowledge of the facts related, climbed the pole, turned on the current by means of the cut-off box, as it is his duty to do when trimmers had left it turned off, and received a shock which threw him to the ground and caused his death. It was here held that the defendant electric light company was liable for damages under the Massachusetts employers' liability act. Wiley vs. Boston Electric Light Company, 168 Mass., 40.

It is well settled law that the master must furnish the servant with reasonably safe appliances for the performance of his work. And if the master fails to do this, or fails to repair a defective apparatus, after reasonable time, then he will be responsible for the resulting damages thereby occasioned to the servant, provided, of course, the servant has himself exercised ordinary care for his own protection. If the servant engages in a hazardous employment, or attempts a service necessarily attended with danger, he will be held to assume all the risks ordinarily incident to the work. In other words, the employer is not an insurer of the safety of his employee. More than this, even where there are defects in the machinery or appliances given into the hands of the servants, still if the peril attending their use "is such as to be perfectly obvious to the sense of any

man, whether master or servant, then the servant assumes the risk." Wray vs. Electric Light and Water Power Company, 68 Mo. App., 380, announces the above proposition of law, the facts therein showing that a lamp trimmer was injured as a result of a defect in a lamp, which was obvious to the most casual observer, and had existed for 18 days before the accident without any report or complaint from the lamp trimmer, whose duty it was to report to the lineman any defects on the circuit which he was unable to repair.

In the case of Smart vs. Electric Light Company, 47 La. Ann., 869, it appeared that one of two linemen working at the top of the pole was killed by a current received from the wires on which he was at work. The foreman in charge of the work sent gloves up to the men for their use. The one of the two who was not injured did not put on the gloves, but worked with his bare hands. The other donned the gloves, but being old and defective they failed to serve the end for which they were intended and their wearer received a fatal shock. The evidence showed that the deceased lineman was competent and experienced and that it was the duty of the linemen to inspect their gloves and turn them in for new ones when they became unfit for use. The claim made by the plaintiff in the action against the company was that the wires upon which the accident occurred should have been made "dead" before the work was commenced. But under the rules of law as set forth above, it was held that the lineman had assumed the risk of injury resulting from the defective condition of the gloves and that the company was, therefore, not liable.

In Junior vs. Electric Light and Power Company, 127 Mo. 79, where a lineman, who had been supplied with rubber gloves with which to work, was killed while working without gloves, it was held that there could be no recovery against the company, as the lineman had been guilty of contributory negligence. In that case the court held that the lineman by his own neglect of the [means furnished him by his employer, brought his hands in contact with the wires and lost his life, and the master is not liable.

It was said in Electric Company vs. Kelly, 57 N. J. L., 100: "The better view of a master's duty to a servant is that which, taking into consideration the well settled doctrine that a servant, by accepting employment, consents to take the risk of all dangers obviously or naturally incident to such employment, imposes on the master a positive duty to take reasonable care and precaution not to subject the servant to other or greater dangers. The rule thus formulated is of wide application, but with reference to such cases as that now under consideration (where a lineman was injured through the breaking of a pole on which he was at work) may be thus stated: The master must take reasonable care to have the tools and appliances with which, and the places on or about which, the servant is to be employed, reasonably safe for the work the latter is employed to do."

It is the duty of the master to inform the servant of peculiar dangers. The following is quoted from the case of Chicago Edison Company vs. Hudson, 66 Ill. App., 639: "The master is bound to inform his servant of all dangers incident to the service of which he, the master, is cognizant, or of which, in the exercise of ordinary care on his part, he would be informed; he is bound to warn the servant of all latent or extraneous dangers of which he himself has knowledge, or of which, in the exercise of ordinary care, he would be informed; and if he fail in this respect, he is liable to the servant for all the consequences resulting to him from lack of such warning. This rule applies to dangers of which the master himself is aware, or ought to know, and which are unknown to the servant, and would not be readily ascertained except by a person possessed of peculiar knowledge, which the master has no reason to suppose the servant possesses. Dangers which are the result of common knowledge, which can be readily seen by common observation, the servant assumes the risk of, but when the danger to be avoided requires a knowledge of scientific fact, an ordinary servant is not presumed to have knowledge of them, and it is the duty of the master, knowing of them, to inform the servant in respect thereto."

As to the master's duty to supply his servant with proper appliances, the following statement is taken from the case of Harroun vs. Brush Electric Light Company, 12 N.Y. App. Div., 126, 152 N.Y., 212, where it was held that the quoted instructions were correct: "The law requires not that degree of diligence and foresight which is required of an insurer, or which the law might require of a corporation towards the public, but simply reasonable care and prudence in the selection of safe and suitable appliances for the use of employees. * * * While in a general way the law requires simply reasonable care and foresight by the employer in the selection and provision of appliances for the use of the employee, that care and prudence must be proportioned to what may properly be expected of him under the circumstances, and increases in a corresponding ratio with the danger and hazard necessarily connected with the use of appliances."

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Oklahoma Gas and Electric Company will add at least 12 miles to its distributing system this season.

MR. JAMES HISLOP, President of the New London (Conn.) Gas and Electric Light Company, died at his home in that city the morning of March 30th. Deceased was in his 62d year, having been born in Peebles, Scotland, February 9th, 1847. He came to America in 1870, and eventually settled in New London, in 1878, to engage in the dry-goods trade as Hislop, Porteons & Mitchell, which subsequently became the firm of James Hislop & Co. Both firms were quite successful. He was prominent in all good walks of life in the section of Connecticut in which he resided, and was noted for his charities, which almost altogether were devoted to bettering the condition of the poor. His immediate survivors are his widow, a daughter and two sons.

WE must also report the death of Mr. Herbert M. Sills, who occupied for some time a responsible position on the rolls of the Peoples Gas Light and Coke Company, of Chicago, whose passing away occurred the afternoon of Sunday, March 29th. He was in his 58th year, having been born May 28, 1850.

"A VERY pleasant happening occurred here in New Orleans the 30th ult., when the Louisiana Section of the American Chemical Society paid a visit in a body to the plant of the New Orleans Gas Light Company. The visitors also embraced a delegation of several young women from the Newcomb College and the Girls' High School, also a number of students from the New Orleans College of Pharmacy. The visitors were escorted through the plant by Mr. Marion R. Redding, who explained in detail the system of the plant and the functions of the various pieces of apparatus therein installed, and his efforts were repaid by a hearty vote of thanks adopted by the party just prior to their leaving the works. Mr. Thos. D. Miller was always within easy striking distance of the travellers.—V. B. R."

"B. T. M." writing from Milwaukee, Wis, under date of the 2d inst., says: "An interesting trial will shortly be held over the merits of the case brought last week against the Milwaukee Gas Light Company by Joseph Fuhlenberg, a member of the Milwaukee Fire Department. Quite some time ago the hose cart which was a part of his command while going to a fire was overturned at the intersection of Walnut and Commerce streets, through coming in contact with the earth thrown up alongside of a ditch in which the Company was placing a pipe. The plaintiff claims that for the moment the ditch was unguarded. The Company denies this, and alleges recklessness on the part of the driver of the cart."

THE Southern Light and Traction Company, of Natchez, Miss., has decided to remove the gas plant from its present location on Pearl street to the power station on St. Catherine street. This likely means that a new plant will be constructed, to all intent and purpose.

THE proprietors of the Citizens Gas and Electric Company, of Waterloo, Ia., have announced a reduction in the selling rate of 5 cents per 1,000 cubic feet—from $1.15 to $1.10 per 1,000. The concession is altogether voluntary.

THE primary vote on the project to establish a gas plant, to be operated on municipal account in Winnetka, Ills., was 68 in favor to 65 against. Now the project will have to be voted on next regular election. Meanwhile the North Shore Gas Company has offered to pay $2,000 into the public treasury if granted a suitable franchise to operate in the named place.

THE General Gas Light Company, of Kalamazoo, Mich., has instituted a literary bureau, with the purpose of sending out in systematic way timely items respecting the "conditions prevailing in commercial lighting in the territory of every gas company." The first publication in this respect was issued from Kalamazoo, under date of March 10th, and its particular reference is to the public lighting of Tacoma, Wash., which city the month before had purchased some 2,800 Nernst lamps on the municipally managed electric current conductors. This matter was mentioned some weeks ago in the JOURNAL, but the General Gas Light Company's circular references to it are well worth reading. The circular also contains other news matter of interest in the connection spoken of—that is, "Exact knowledge of conditions

prevailing in the commercial lighting in the territory of every gas company."

MR. H. S. BELL, President of the Coos Bay Gas and Electric Company, reports the completion of the oil gas plant at North Bend, Ore., which is to supply gas to both North Bend and Marshfield. The steam is obtained from the electric light plant which has been in operation there for some time. The apparatus complete for the gas plant was constructed and set up by the Gas Machinery Company, of Cleveland, O.

THE J. G. White Company, through the cleverness mainly of Messrs. Joseph R. Lane and W. E. Barrett, has succeeded in putting an end to the very unsatisfactory conditions that have existed for quite some time in the gas and electric lighting supply of Davenport, Ia. The White corporation has purchased the properties of the Independent Light and Power Company—the inception of this concern was not noted for regularity in respect of its dealings with the authorities—and have added the same to their possessions in the three cities of Moline, Rock Island and Davenport. "All's well that ends well."

THE Bristol Company, of Waterbury, Conn., is now under the control of Prof. William H. Bristol, whose inventions have been the property of this Company since the date of its organization in 1889. Prof. Bristol assumed active charge of its trading on Friday, 28th, and he now owns the majority interest. The business which has been carried on under the personal name of Wm. H. Bristol, at New York, will hereafter be combined with that of the Bristol Company, and by the noted consolidation of interests the Bristol Company will now have the most complete line of recording instruments in the world for pressure, temperature, electricity and a great variety of other applications.

"DEAR JOURNAL: On March 28th about 2:30 P.M., Mayor Harper, in the presence of 800 or more of the representative persons of Los Angeles, Cal., twisted a turn or so in a valve, and the new gas plant of the City Gas Company, of Los Angeles, went into active operation without a single hitch. The Los Angeles *News* of that date told the story in rather succinct form and these extracts therefrom will be equal to telling the tale of the City Company and its works: * * * 'Conditions which led to the formation of the City Gas Company, of Los Angeles, have passed into history. * * * The Company was organized February, 1907, with a capital of $1,000,000. The stock was subscribed mostly by local capital. There are no bonds and no stock for sale. The capital was fully paid in, and ground for the plant was broken August 20, 1907, and construction was pushed with so much vigor that the plant was soon completed and gas turned on March 10, 1908. The works cover an area of 6½ acres. They consist of a boiler and engine house, 48 by 32 feet, built of reinforced concrete; a generator house, 98 by 54 feet, two oil tanks, each with a capacity of 7,500 barrels; two sets of purifiers, 32 feet long by 12 feet high, with a capacity of 5,000,000 cubic feet a day; a rotary station meter, capacity 5,000,000 cubic feet a day; distributing storage holder, capacity 1,000,000 cubic feet; relief holder, capacity 150,000 cubic feet. The generator house has 4 generators with a daily capacity of 1,250,000 cubic feet. The foundations were planned to accommodate 4 additional generators, increasing the capacity to 10,000,000 cubic feet, thus providing for future demands. Forty miles of trunk mains have been laid, and it is expected to have the first 100 miles completed by the end of June. J. M. Berkeley, the Engineer of the Company, was the constructing engineer, and with the valuable assistance of A. Ross, General Manager, formerly General Manager of the Laclede Gas Light Company, of St. Louis, has put up a plant that lacks nothing money and modern science could supply.' The officers are: President, J. F. Sartori; First Vice-President and Secretary, R. H. Miner; Second Vice-President, M. J. Connell; Treasurer, J. E. Fishburn; General Manager, Alexander Ross; Chief Engineer, Jos. M. Berkeley. The two latter gentlemen certainly deserve great credit for the planning and its working out so well.—L. T. W."

THE affairs of the Peoples Gas and Electric Company, of Defiance, O., have been put in the hands of a receiver. Failure to comply with the terms of a first mortgage (amounting to $150,000) was the inciting cause.

JUDGE CARLAND, of the United States Circuit Court for that district, has issued an order providing for the sale of the properties of the Mitchell (S. D.) Gas Company. The bondholders made the application.

THE following letter, which came to us from Peoria, Ills., under date of the 1st inst., is self-explanatory:

To the Editors AMERICAN GAS LIGHT JOURNAL: In justice to Mr. A. B. Eilbeck, the present Manager of the Chattanooga (Tenn.) Gas Company, and under whose able supervision the reconstruction work there is progressing so well, kindly correct the statement in your last issue in reference to me in connection with the erection of a 1,000,000 cubic foot storage holder in that city. I had fondly hoped to see the completion of this work, but was foolish enough to overestimate my capacity for work, and am now paying the price of my mistake. My recovery has been so satisfactory that I have every reason to expect to be again at work in the near future.—J. M. ROBB.

MR. M. W. NELSON recently resigned the position of Assistant Purchasing Agent for the Detroit City Gas Company to organize the M. W. Nelson Company, which has engaged in the sale of steam plant appliances. Its headquarters are in the Detroit Gas Company's new office building.

MR. A. J. Meyer, formerly representing the new business division of the Greenfield (Mass.) Gas Light Company, has been appointed Manager of the new business department of the Westchester Lighting Company, with headquarters in the Company's main offices in Mount Vernon, N. Y.

LAST week we noted that the Lynn (Mass.) Gas and Electric Company was contemplating the addition of 2 benches of 6's on the inclined plan to its present generating system of that type. While it is true the Company was contemplating an addition to its generating plant we may add now to that by saying the Company has awarded a contract for the installing of 5 benches of 9's on the inclined plan to Mr. Frederick J. Mayer, the representative in this country of the world famous Didier-March Company.

"HINKY" DINK, "Bath House" John, and other members now or formerly members of the city government of Chicago, are sadly disappointed over the first official test made by the Gas Inspectors appointed some time ago to determine "whether or not the gas supplied by the Peoples Gas Light and Coke Company was up to standard legal requirement." The initial test was made by Inspector Burke the night of the 1st inst.—the test of course being made under cover—in the dark, as it were. That is to say, the officials of the Company were not informed when or where the test was to be made. The standard specifies 22-candle power. The report was this: "We tested the gas at the works at Loomis and 25th streets to-night and found it to be between 27 and 28-candle power." Enough said.

MR. E. I. GRANDER, owing to ill health, has been obliged to resign the Superintendency of the Consolidated Gas Company, Schuylkill, Pa.

MR. GEORGE COLGATE has been appointed Manager of the Canandaigua (N. Y.) Electric and Gas Light Company.

THE baseball division of the Consolidated Gas Company's (Baltimore) Athletic Association will be ready by the 1st prox. to consider challenges from the team of any gas company. M. H. Milton is the one to communicate with, at Lexington and Liberty streets, Baltimore, Md.

THE Plumbers' Union, of Springfield, Mass., has made a protest to the local authorities urging that the Springfield Gas Light Company be estopped from carrying on the business of fitting new houses with gas piping. What do you think of that? Particularly if one remembers that the up-to-date plumbers of Springfield decline to pipe old houses. That is, houses which were built several years ago, in which no provision whatever had been made for a gas supply!

THE New Haven (Conn.) Company will extend its main system to Indian Neck, Pine Orchard and Branford this spring.

AT the annual meeting of the Houston (Tex.) Gas Company these officers were chosen: Directors, C. A. Hanna, J. A. Baker, Jr., C.W. Beall, W. S. Lloyd, Charles Dillingham, F. B. Parker and C. H. Dunbar; President, James M. Baker, Jr.; Vice-President, Charles Dillingham; Secretary and General Manager, C. H. Dunbar.

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MONDAY, APRIL 13, 1908.

The Market for Gas Securities.

The hardening in quotations for Consolidated gas continues, and there can be no doubt about the fact that much of the purchasing was done by people who buy mainly on investment account. The opening to-day (Friday) was at 116½, and at noon 120½ was freely bid. Attorney Jackson in his particular role of swashbuckler, this time in respect of his threatened "actions" for annulment of charter, etc., was flatly knocked out by the Courts, and this we believe ends the pretended suits of the order *Fliegende Blätter*.

Brooklyn Union keeps strong, and it has been said in the street it is not at all impossible that this Company and the Consolidated may this summer enter into some sort of a purchasing arrangement on actual merchandise account. Peoples, of Chicago, has again crossed the 90 mark.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks,
16 WALL STREET, NEW YORK CITY.

APRIL 13.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	120¾	120¾
Central Union Gas Co.—				
1st 5's, due 1927, J. & J.	3,000,000	1,000	92	7
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	—	105
Mutual	3,500,000	100	—	170
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	84	86
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98	104
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	100	105
Con. 5's, due 1945, J. & J.	1,500,000	—	97	101
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	90	96
Standard	5,000,000	100	70	100
Preferred	5,000,000	100	100	125
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	100	105
The Brooklyn Union	15,000,000	1,000	110	110
1st Con. 5's, due 1948, M. & N.	15,000,000	—	91¾	92
Yonkers	200,000	500	120	—
Out-of-Town Companies.				
Bay State	50,000,000	50	1	1 1-16
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	65
" 1st Mtg. 5's	500,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
" " Bonds, 5's	5,250,000	1,000	62	66
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,000,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	90½	91
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	92	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	87	88
Preferred	3,026,500	100	81	82
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	—	105
Mortgages, 6's	3,600,000	—	—	118
Chesapeake, 1st 6's	1,000,000	—	—	—
Equitable, 1st 6's	910,000	—	—	—
Consolidated, 1st 5's	1,490,000	—	—	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	—	—	100
Denver Gas and Electric	—	—	74½	75
Detroit City Gas Co.	6,000,000	50	—	50
" Prior Lien 5's	4,618,000	1,000	—	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	30	40
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Lt. Co., 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	100	105
" Bonds, 5's	10,000,000	—	101	102½
Indianapolis	2,000,000	—	60	70
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	10	82	—
" 1st Mtg. 5's	200,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	97	97¼
Preferred	2,200,000	100	92½	93
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108½
" 6 per cent. scrip, due 1910	100,000	25	60	60½
Massachusetts Gas Companies, of Boston	25,000,000	100	51	51¼
Preferred	25,000,000	100	85½	86
Montreal, Canada	2,000,000	100	218	218½
Nashville Gas Lt. Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	56	58
Bonds, 6's	2,000,000	—	137	138
New Haven	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	90½	91
1st Mortgage	20,100,000	1,000	—	—
2d "	2,500,000	1,000	104	—
Rochester Gas & Elec. Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 6's	2,000,000	—	104½	105½
San Francisco, Cal.	15,500,000	—	—	—
St. Joseph Gas Co.—				
1st Mtg. 5's	751,000	1,000	92	—
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgages, 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	—
Syracuse, N. Y.	1,375,000	100	50	55
Bonds	2,047,000	1,000	102	—
Washington, D. C.	2,800,000	20	307	310
1st Mortgage, 6's	600,000	—	—	—
Western, Milwaukee	4,000,000	—	—	—
Wilmington, Del.	600,000	50	230	—

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Missouri Firebrick Co., St. Louis, Mo. ... 640
Parker-Russell Mining and Mfg. Co., St. Louis, Mo. ... 644

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R. D. Wood & Co., Philadelphia, Pa. ... 654
Stacey Mfg. Co., Cincinnati, O. ... 655
Western Gas Construction Co., Fort Wayne, Ind. ... 660

(Continued on page 634.)

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., N. W. CORNER BROAD AND ARCH STS., PHILADELPHIA, PA., March 11, 1908.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 15th, 1908, to stockholders of record at the close of business, March 31, 1908. Checks will be mailed.

1710-5 LEWIS LILLIE, Treasurer.

WANTED,

A Position as Superintendent or Foreman of a Coal or Water Gas Plant.

Have had 12 years' practical experience in both. First-class references furnished.

1713-2 Address, "V. W.," care this Journal.

Position Wanted

By a Water Gas Maker.

A young married man, with 10 years' practical experience in making gas and distribution department. Can run one or two machines and can take part about the works. Good references of long and steady employment.

1714-1 Address, "GENERATOR," care this Journal.

Position Wanted

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WANTED,

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(Concluded from page 633.)

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The Gas Machinery Co, Cleveland, O. 636
The P. H. & F. M. Roots Co., Connersville, Ind. 643
Western Gas Construction Co., Fort Wayne, Ind. 660

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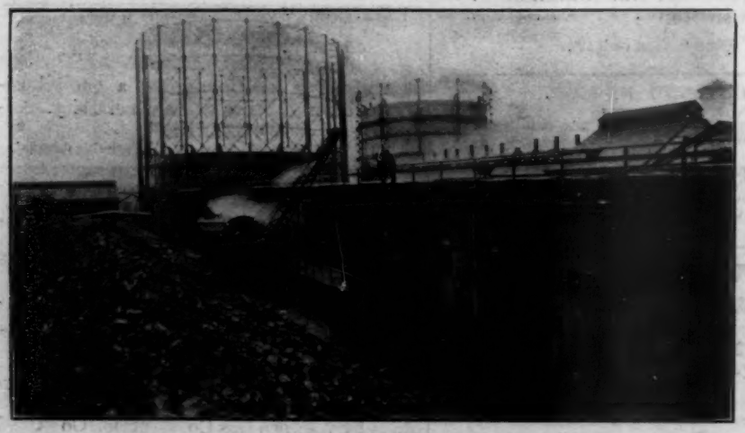

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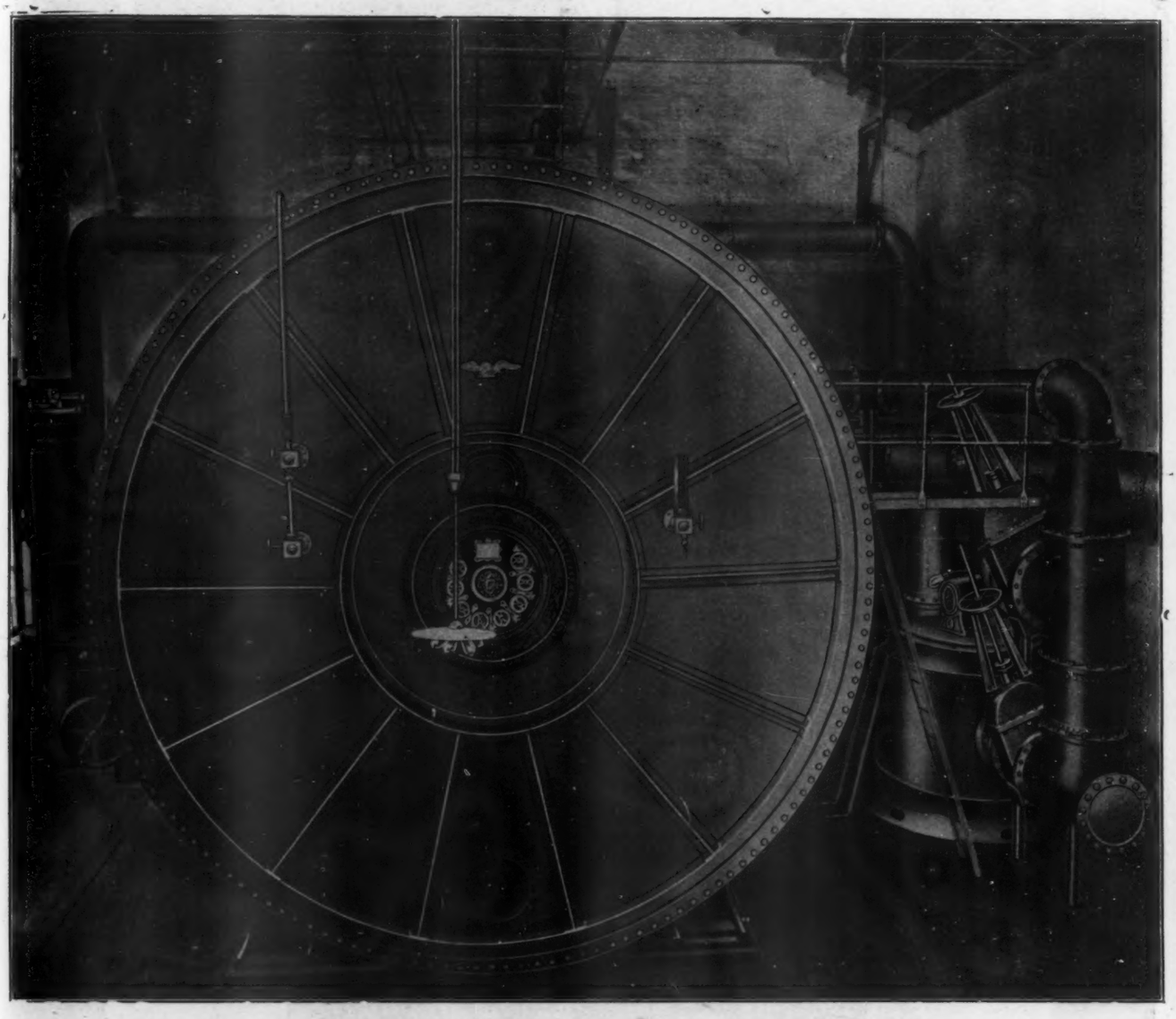

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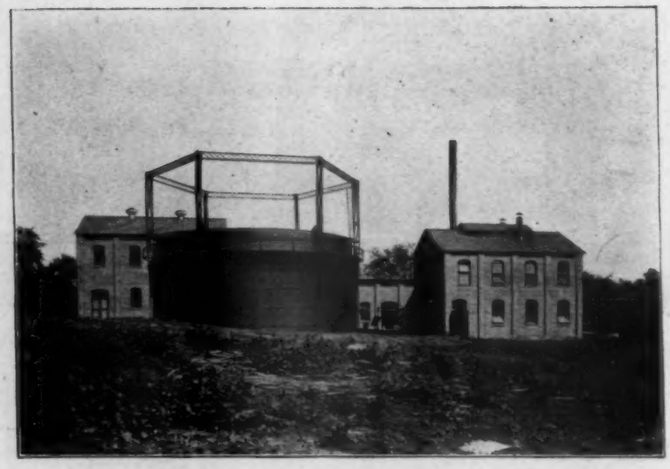

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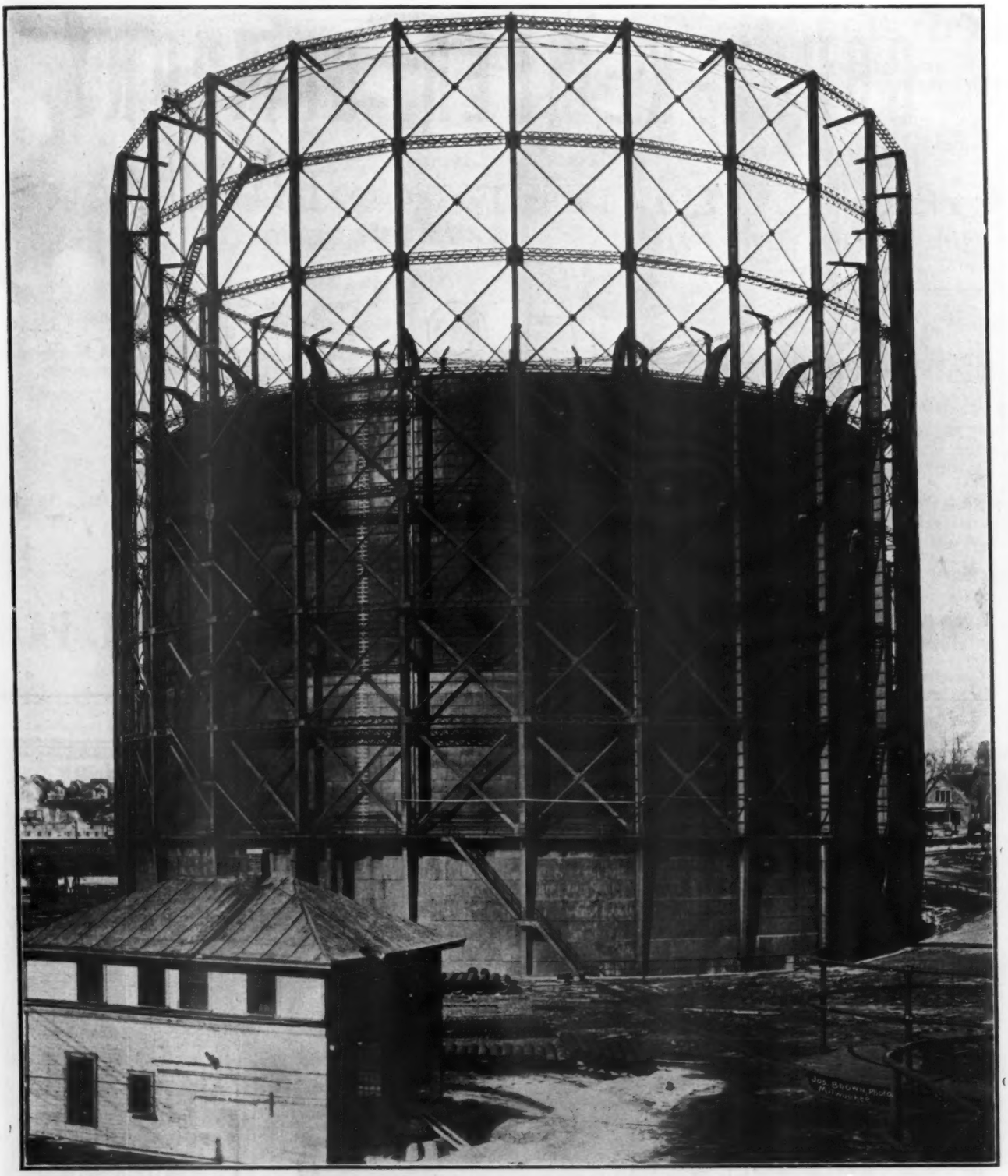

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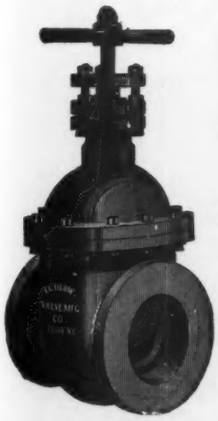

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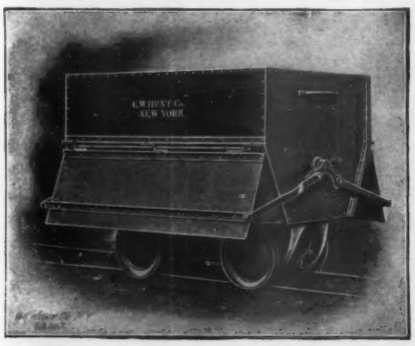

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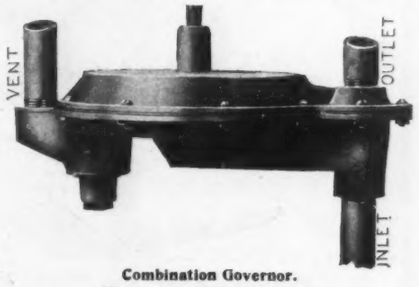

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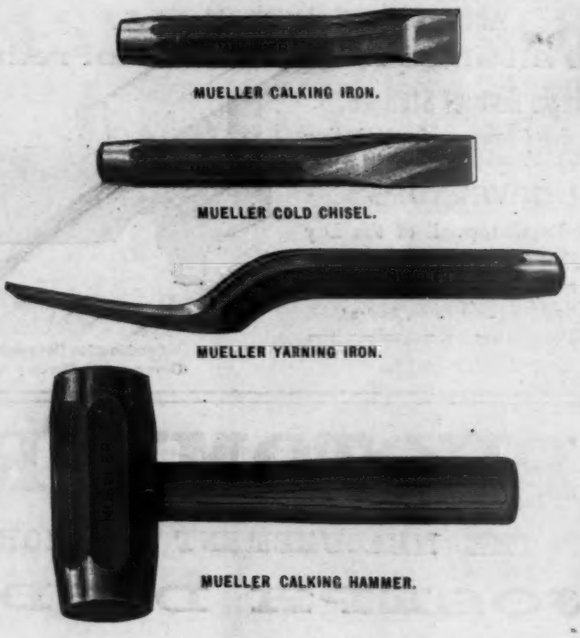

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

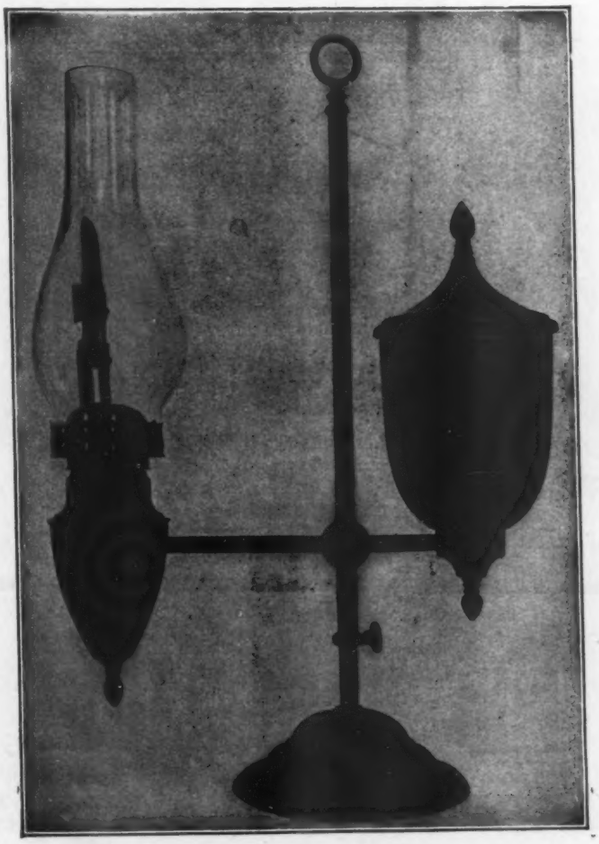
APRIL, 1908.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Wed.	1	6.50 PM	4.40 AM
Thu.	2	6.50	4.40
Fri.	3	6.50	4.40
Sat.	4	6.50	4.40
Sun.	5	10.30	4.30
Mon.	6	11.20	4.30
Tue.	7	12.20 AM	4.30
Wed.	8	1.00 FQ	4.30
Thu.	9	1.40	4.30
Fri.	10	2.20	4.30
Sat.	11	2.50	4.30
Sun.	12	3.20	4.30
Mon.	13	3.50	4.30
Tue.	14	4.10	4.30
Wed.	15	No L.	No L.
Thu.	16	No L. FM	No L.
Fri.	17	No L.	No L.
Sat.	18	7.10 PM	10.00 PM
Sun.	19	7.10	11.00
Mon.	20	7.10	12.10 AM
Tue.	21	7.10	1.10
Wed.	22	7.10	2.10
Thu.	23	7.10 LQ	3.00
Fri.	24	7.10	3.40
Sat.	25	7.10	4.00
Sun.	26	7.20	4.00
Mon.	27	7.20	4.00
Tue.	28	7.20	4.00
Wed.	29	7.20	4.00
Thu.	30	7.20 NM	4.00

TOTAL HOURS DURING 1908.

By Table No. 1.

	Hrs.Min.
January	228.30
February	187.30
March	192.00
April	160.10
May	155.10
June	138.00
July	155.50
August	173.40
September	185.20
October	214.00
November	218.10
December	226.40
Total, yr.	2235.00



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This lamp is a perfect substitute for the 10-candle Pentane Lamp hitherto used, and has the following advantages:

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3d. It is much less dangerous than Pentane, which is a kind of gasolene.

4th. It is not easily affected by air currents in the photometer room.

5th. Since the lamp may burn continuously, the candle power of gas may be taken at any moment, if necessary. This insures steady illuminating power without waste of carburetting material.

6th. The first cost of the lamp brings it within the reach of even small gas works.

7th. Costs much less to maintain than a Pentane lamp or sperm candles doing the same service.

8th. Is not affected by the weather.

PUBLIC LIGHTING TABLE.

APRIL, 1908.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Complete Lighting in One Hour	Complete Extinguishing in 50 Minutes
		From Time Given	
		P. M.	A.M.
Wed.	1	5.57	4.47
Thu.	2	6.07	4.37
Fri.	3	6.07	4.37
Sat.	4	6.07	4.37
Sun.	5	6.07	4.37
Mon.	6	6.07	4.32
Tue.	7	6.07	4.32
Wed.	8	6.07	4.32
Thu.	9	6.17	4.22
Fri.	10	6.17	4.22
Sat.	11	6.17	4.22
Sun.	12	6.17	4.22
Mon.	13	6.17	4.22
Tue.	14	6.17	4.22
Wed.	15	6.17	4.22
Thu.	16	6.27	4.17
Fri.	17	6.27	4.17
Sat.	18	6.27	4.17
Sun.	19	6.27	4.12
Mon.	20	6.27	4.12
Tue.	21	6.27	4.12
Wed.	22	6.27	4.12
Thu.	23	6.37	4.02
Fri.	24	6.37	4.02
Sat.	25	6.37	4.02
Sun.	26	6.37	4.02
Mon.	27	6.37	4.02
Tue.	28	6.37	4.02
Wed.	29	6.37	4.02
Thu.	30	6.47	3.52

TOTAL HOURS DURING 1908.

	Hrs.Min.
January	481.50
February	329.15
March	351.50
April	341.50
May	233.05
June	218.10
July	282.55
August	254.55
September	292.25
October	420.45
November	374.30
December	411.05
	3992.35
Deduct on account of 50 min. extinguishing time	30.30
Total, yr.	3962.05

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Atlanta, Ga. (2d contract).
Holyoke, Mass.
Peoria, Ills.
Schenectady, N. Y. (2d contract).
Danbury, Conn.
Galveston, Tex. (2d contract).
Quebec, Canada.
Indianapolis, Ind. (2d contract).
Bessemer, Ala.
Waterbury, Conn. (5th contract).
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Philadelphia, Pa.
New Hartford, Conn.
Poughkeepsie, N.Y. (2d contract).
Nashville, Tenn.
Salisbury, Md.
Norfolk, Va. (4th contract).
Wallingford, Conn.
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Oak Bluffs, Mass.
Arlington, Mass.

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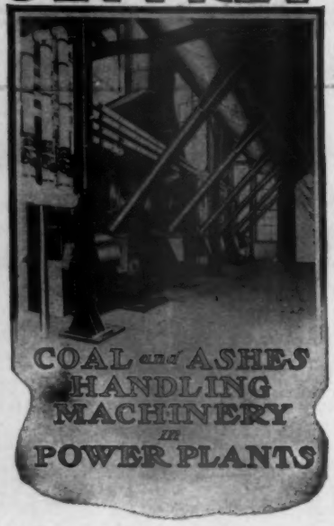

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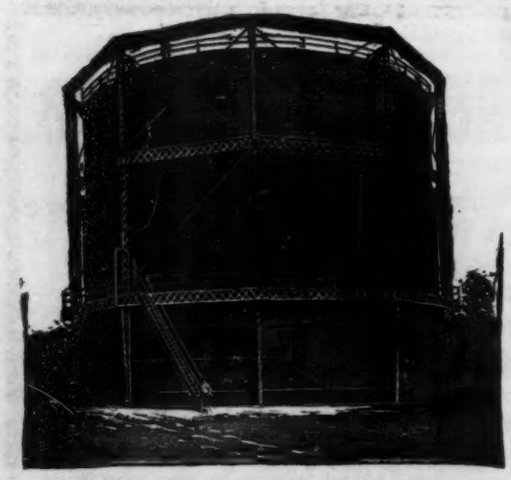

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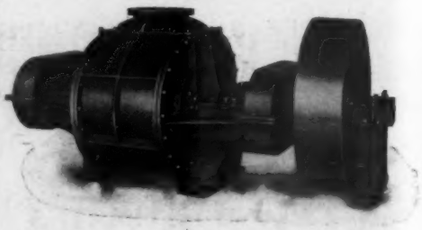

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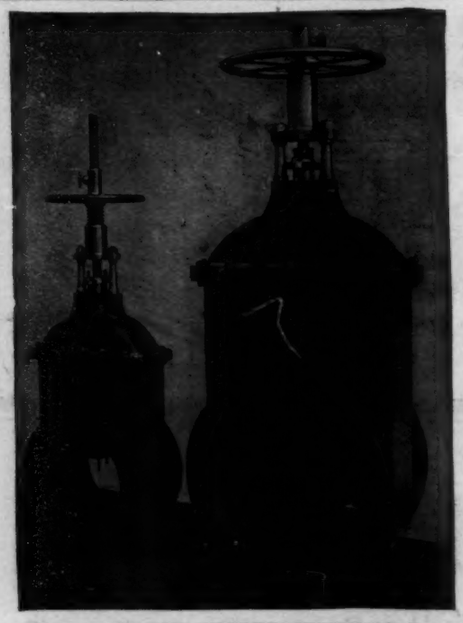

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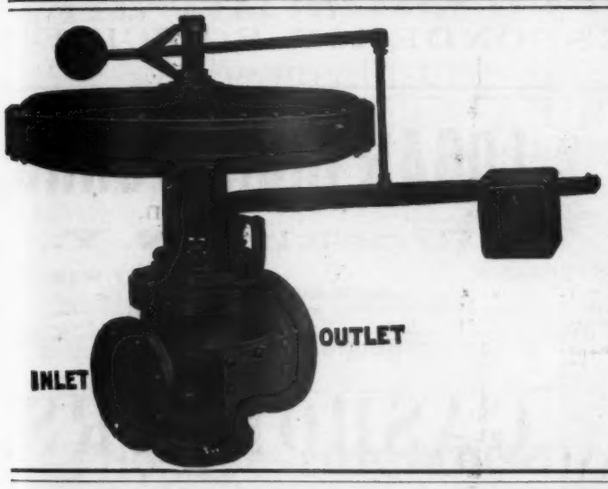

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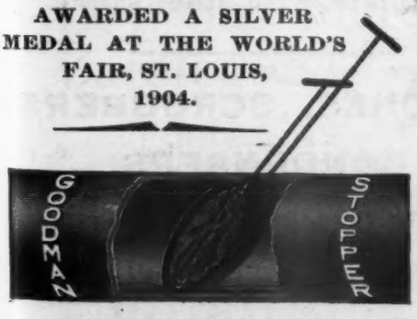

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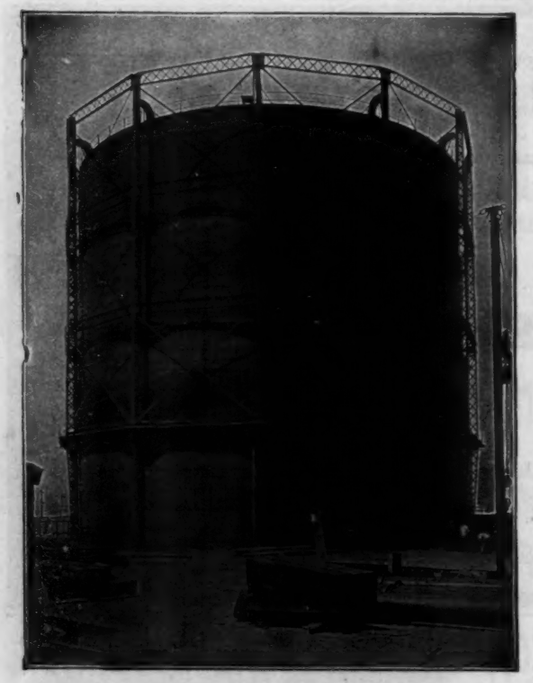

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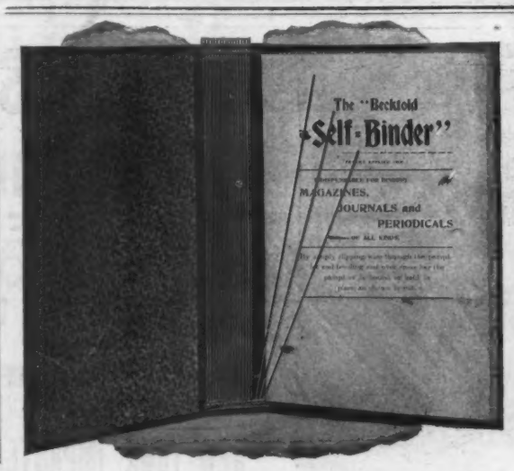

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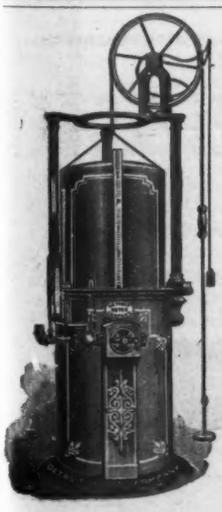

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